

# **Back To Chiropractic CE Seminars**

## **Thriving in Our Toxic World ~ 6 Hours**

**Welcome to Back To Chiropractic Online CE exams:**

**This course counts toward your California Board of Chiropractic Examiners CE. (also accepted in other states, check our website or with your Chiropractic State Board)**

**The California Board requires that you complete all of your CE hours BEFORE the end of your Birthday month. We recommend that you send your chiropractic license renewal form and fee in early to avoid any issues.**

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- 5. Click on the Exam for the course you want to take. No passwords needed.**
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- 7. Upon passing the exam you'll be able to immediately download your certificate, and it'll also be emailed to you. If you don't pass, you can repeat the exam at no charge.**

**Please retain the certificate for 4 years.**

**If you get audited and lose your records, I'll have a copy.**

**I'm always a phone call away... 707.972.0047 or email: [marcusstrutzdc@gmail.com](mailto:marcusstrutzdc@gmail.com)**

**Marcus Strutz, DC**

**Back To Chiropractic CE Seminars**



# THRIVING IN OUR TOXIC WORLD

KIM B. KHAUV, DC MPH



“Sola dosis facit  
venenum”

“Only dose makes the  
poison”

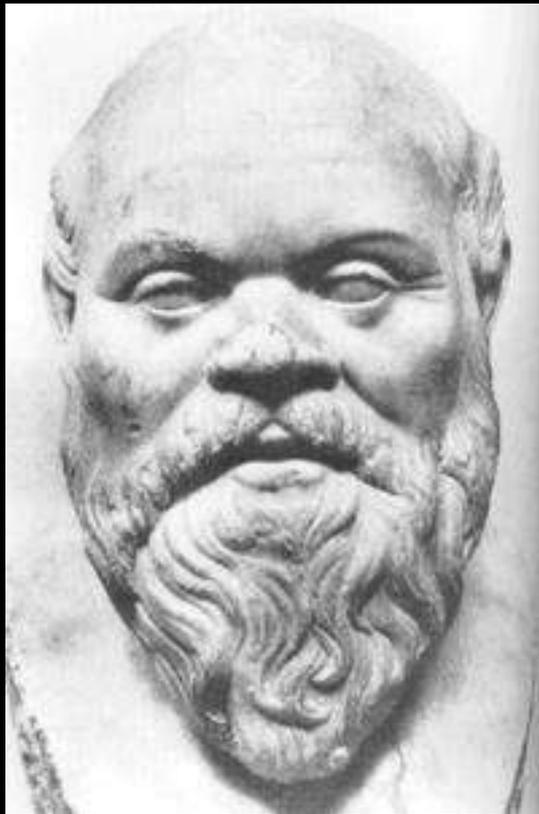
- Paracelsus, the father of  
modern toxicology  
(16th Century)

# TOXICOLOGY EFFECTS

- Our Home environment
- Our Workplace
- Our air/water/land/food
- Biological/Chemical warfare
- Government Decisions
- Global and local environment

# ANCIENT AWARENESS

## 399 BC Socrates: Death By Poisonous Hemlock

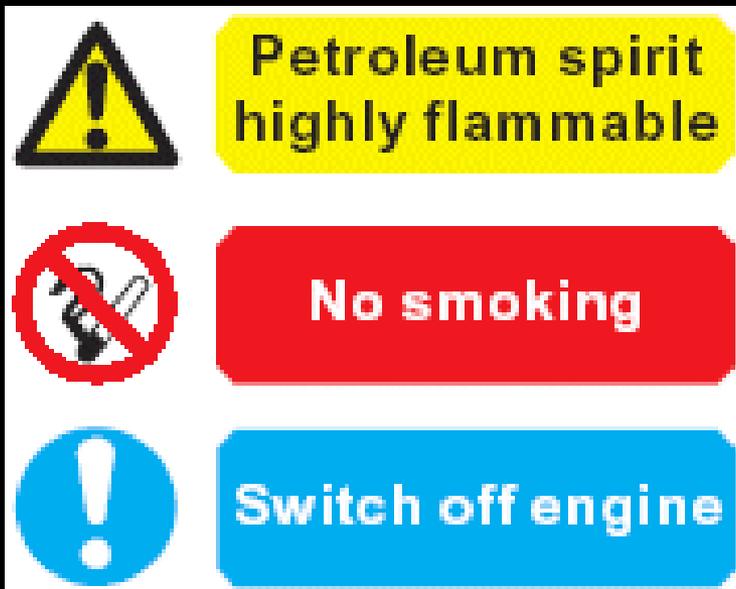


Socrates was charged with religious heresy and corrupting the morals of local youth.

The active chemical used was the alkaloid coniine which, when ingested disrupts the central nervous system causing paralysis, convulsions and potentially death.

# INTRODUCTION TO TOXICOLOGY

## RISK AND SAFETY

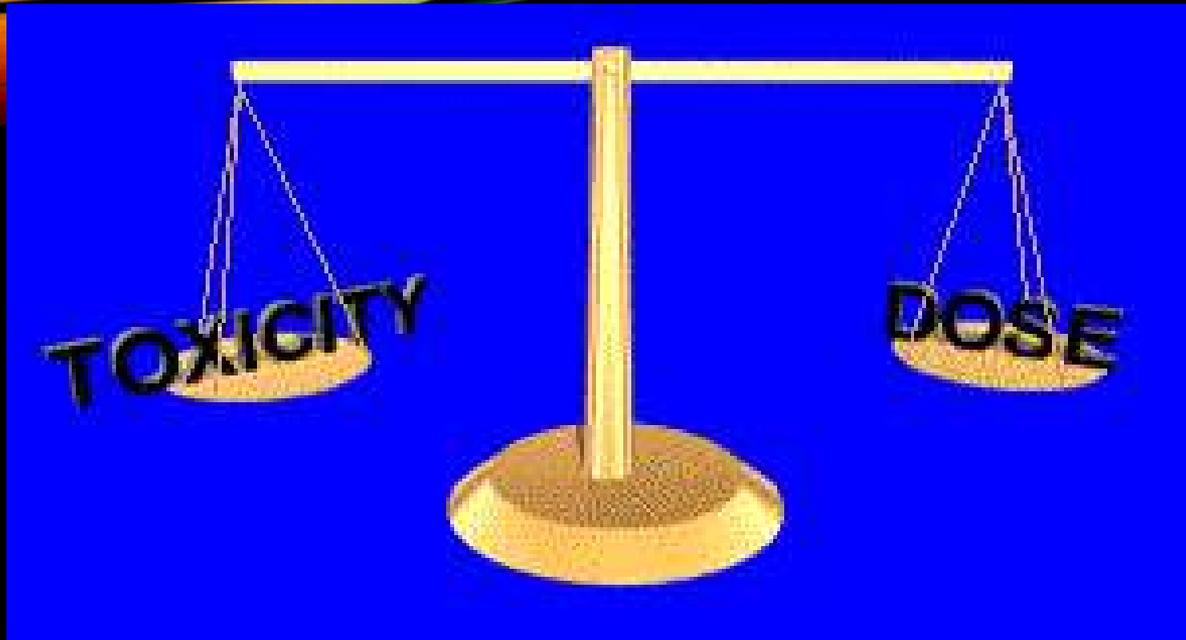


RISK; the probability that harm will occur under specified conditions

SAFETY; the probability that harm will not occur under specified conditions

# ADVERSE EFFECTS

- Obvious: Death, chemical burn, caffeine jitters
- Subtle or Delayed: Decrease in learning and memory (lead), increased likelihood of cancer (smoking)



## MAJOR FACTORS THAT INFLUENCE TOXICITY

- route of administration
- duration and frequency of exposure
- dose or concentration

## TOLERANCE

- state of decreased responsiveness to a toxic effect of a chemical, resulting from previous exposure
- dispositional tolerance; a decreased amount of drug reaching the site
- cellular; reduced responsiveness of a tissue

# DOSE RESPONSE

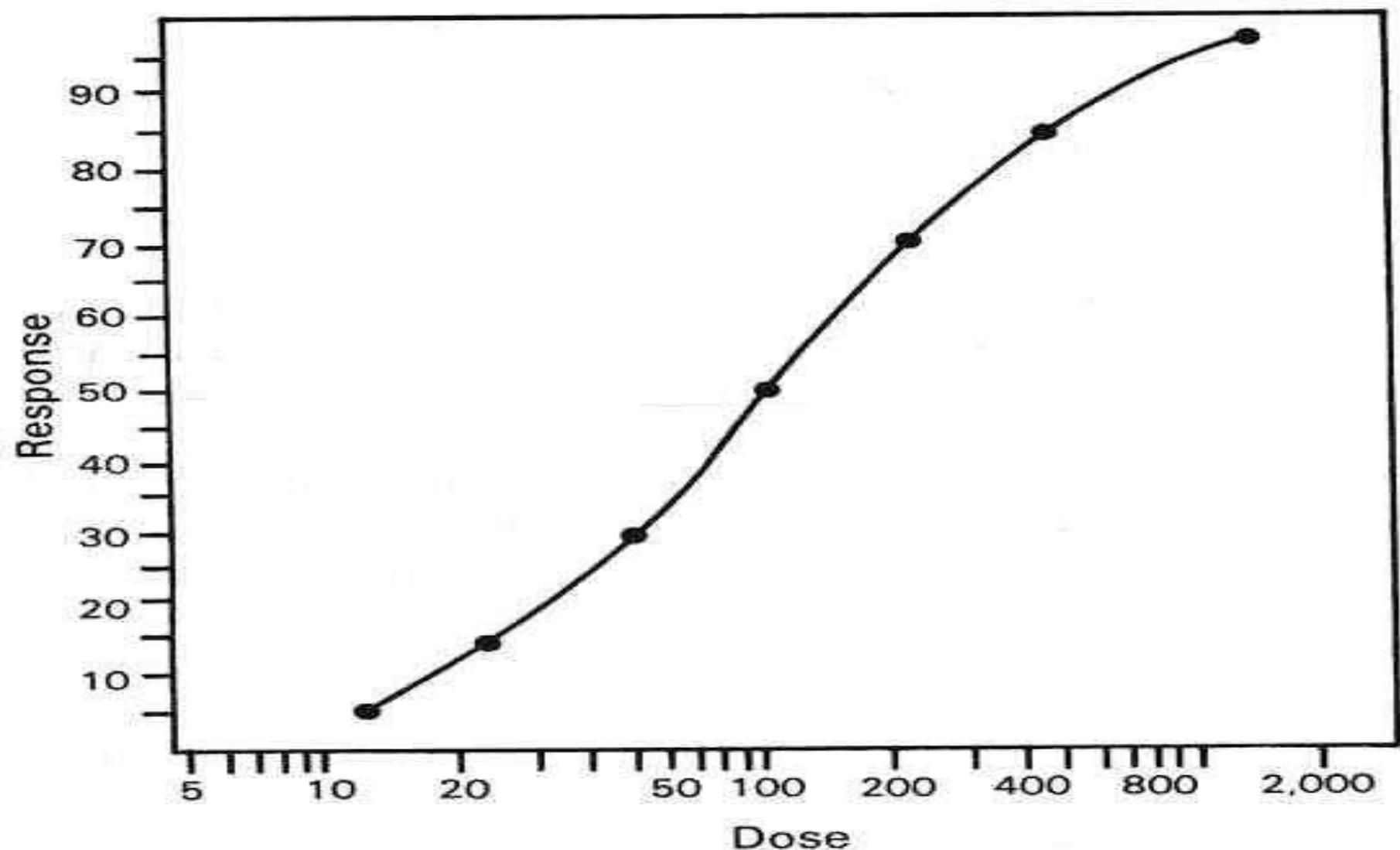
## ASSUMPTIONS

- response is due to chemical administered
- the response is related to the dose
- there is a receptor site with which the chemical interacts

# DOSE RESPONSE

## ASSUMPTIONS (contd)

- the degree of response is related to the concentration at the site
- the concentration at the site is related to the dose administered
- has a quantifiable method of measuring and a precise means of expressing the toxicity



**Figure 2-2.** Diagram of dose-response relationship. Dosage is most often expressed as mg/kg and plotted on a log scale.

From Casarett & Doull's, Toxicology  
3rd Edition, 1986

# PRINCIPLES OF TOXICOLOGY

Table 2-2. TOXICITY RATING CHART

PROBABLE LETHAL ORAL DOSE FOR HUMANS

TOXICITY RATING OR CLASS

*Dosage*

*For Average Adult*

|                         |              |                                 |
|-------------------------|--------------|---------------------------------|
| 1. Practically nontoxic | > 15 g/kg    | More than 1 quart               |
| 2. Slightly toxic       | 5-15 g/kg    | Between pint and quart          |
| 3. Moderately toxic     | 0.5-5 g/kg   | Between ounce and pint          |
| 4. Very toxic           | 50-500 mg/kg | Between teaspoonful and ounce   |
| 5. Extremely toxic      | 5-50 mg/kg   | Between 7 drops and teaspoonful |
| 6. Supertoxic           | < 5 mg/kg    | A taste (less than 7 drops)     |

CASARETT AND DOULL'S, TOXICOLOGY, THIRD EDITION

**Table 2-1. APPROXIMATE ACUTE LD50'S OF SOME REPRESENTATIVE CHEMICAL AGENTS**

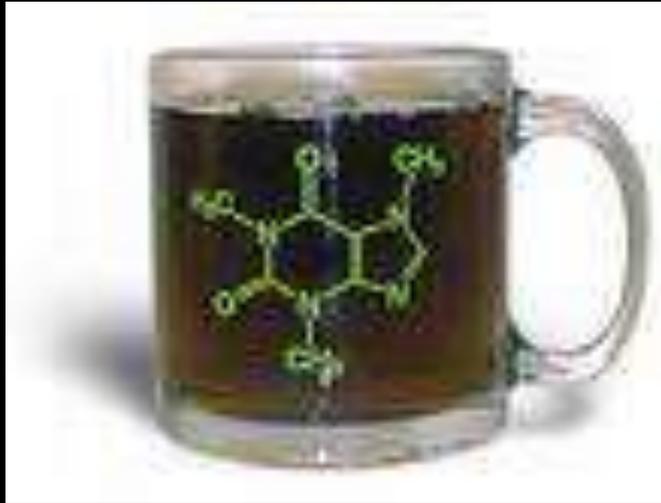
| AGENT                  | LD50 (mg/kg)* |
|------------------------|---------------|
| Ethyl alcohol          | 10,000        |
| Sodium chloride        | 4,000         |
| Ferrous sulfate        | 1,500         |
| Morphine sulfate       | 900           |
| Phenobarbital sodium   | 150           |
| Picrotoxin             | 5             |
| Strychnine sulfate     | 2             |
| Nicotine               | 1             |
| <i>d</i> -Tubocurarine | 0.5           |
| Hemicholinium-3        | 0.2           |
| Tetrodotoxin           | 0.10          |
| Dioxin (TCDD)          | 0.001         |
| Botulinum toxin        | 0.00001       |

Botox anyone?

\* LD50 is the dosage (mg/kg body weight) causing death in 50 percent of the exposed animals.

From Casarett & Doull's, Toxicology  
3rd Edition, 1986

# CHEMICAL OR PHYSICAL AGENTS

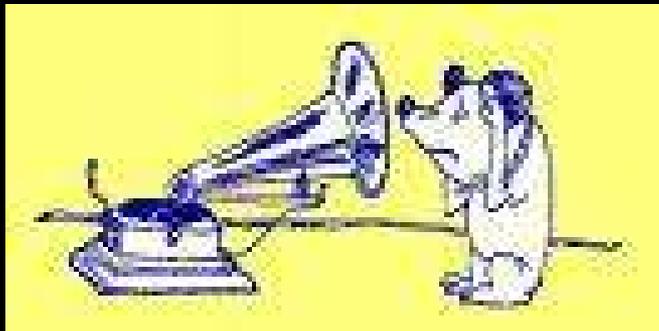


## Chemical agents

Natural or manufactured

Bacteria, plants and animals produce toxins  
(caffeine)

Manufactured chemicals  
(pesticides)



## Physical agents

Temperature (damage fish)

Sound (damage hearing)

# ENVIRONMENTAL HEALTH

**Childhood lead exposure**

**Prenatal alcohol exposure**

**Mercury in gold mining**

**Methyl mercury in food supply**

**DDT use**

# EFFECTS OF FETAL ALCOHOL

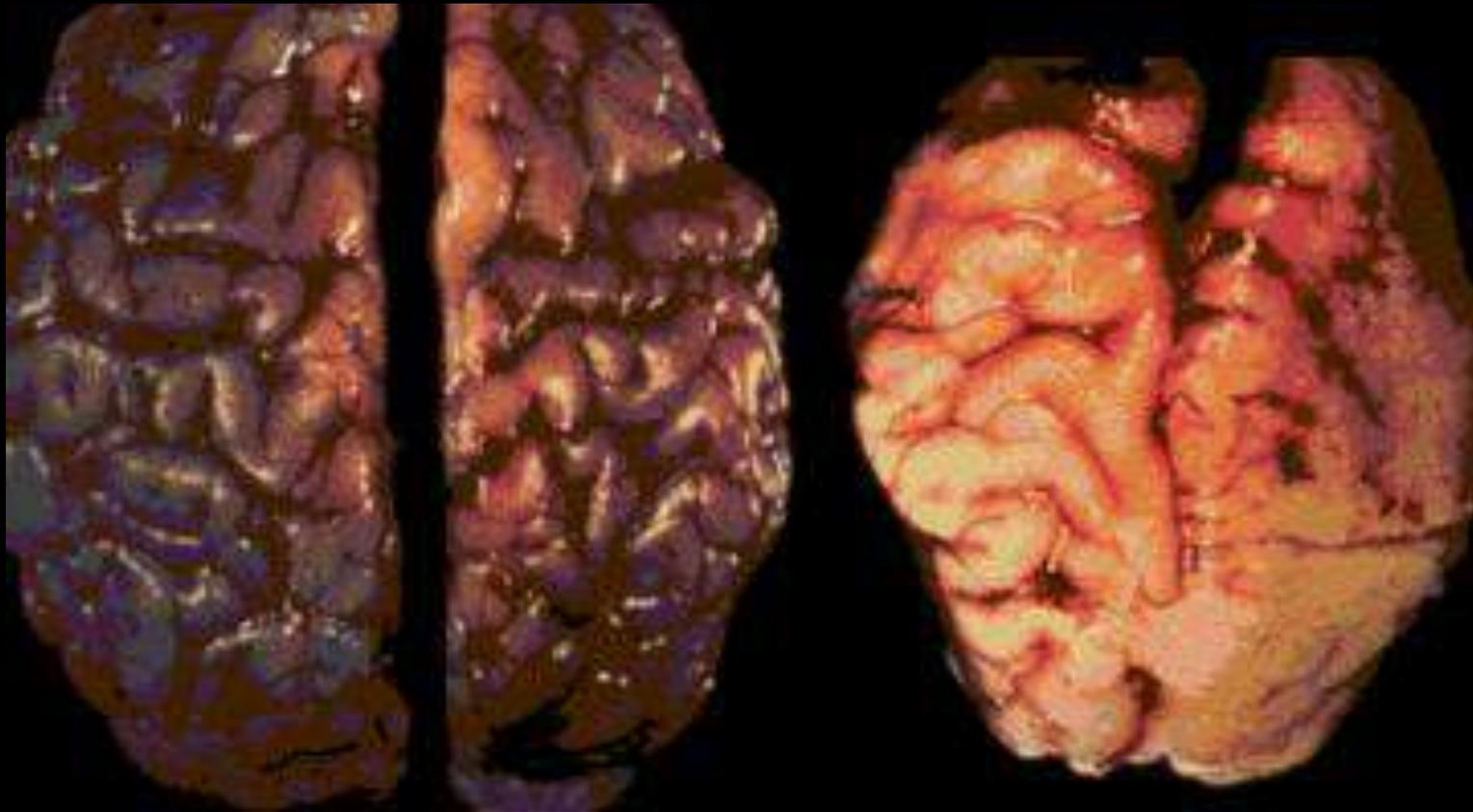


Photo courtesy of Sterling Clarren, MD

Pb

Lead

Atomic Number: 82

Atomic Mass: 207.20

**WHAT BLACK CONSERVATIVES WANT**

Clarence Thomas and the Court

# Newsweek

July 16, 1991 • \$2.50

## LEAD And Your Kids

Disturbing New Evidence  
About the Threat  
to Their Health

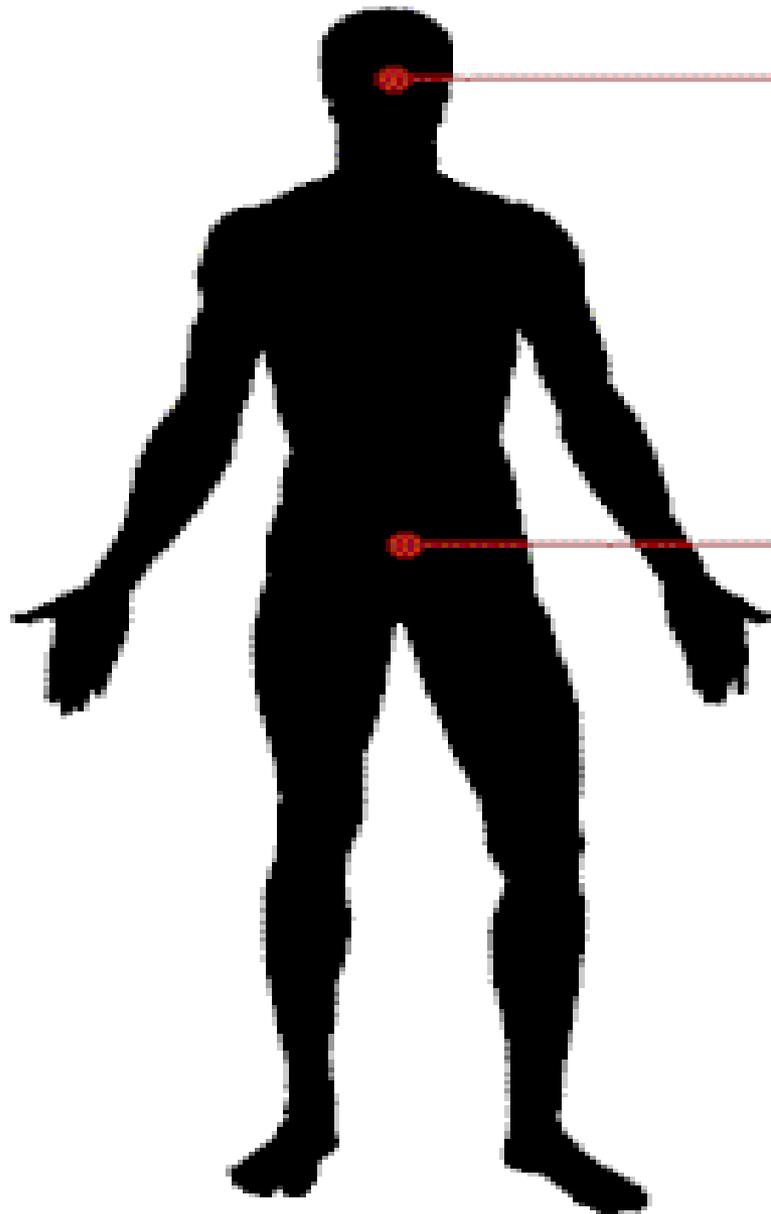
How to Protect Them



# Early Symptoms of Lead Poisoning

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21



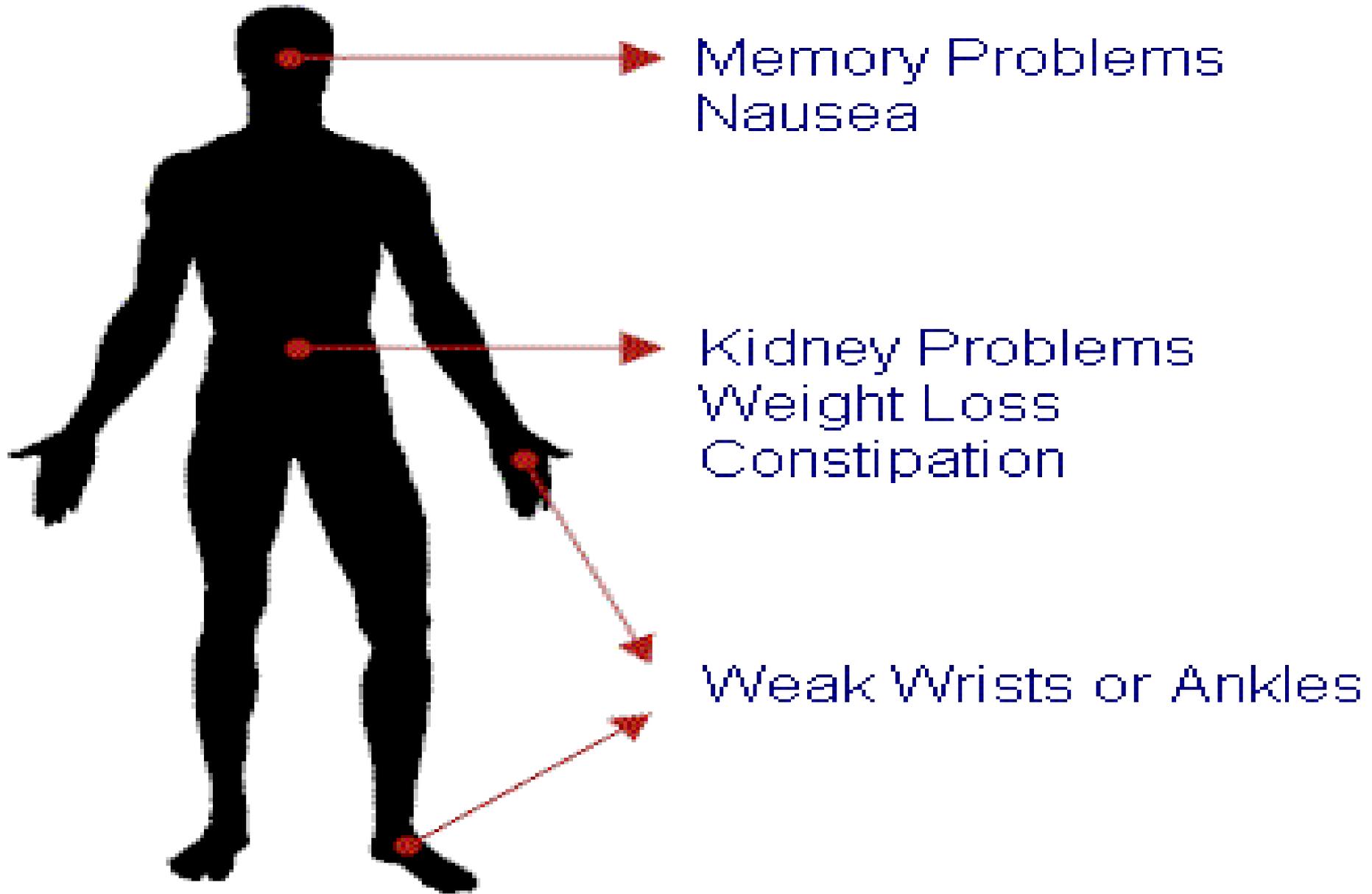
Fatigue  
Headaches  
Irritability  
Metallic Taste

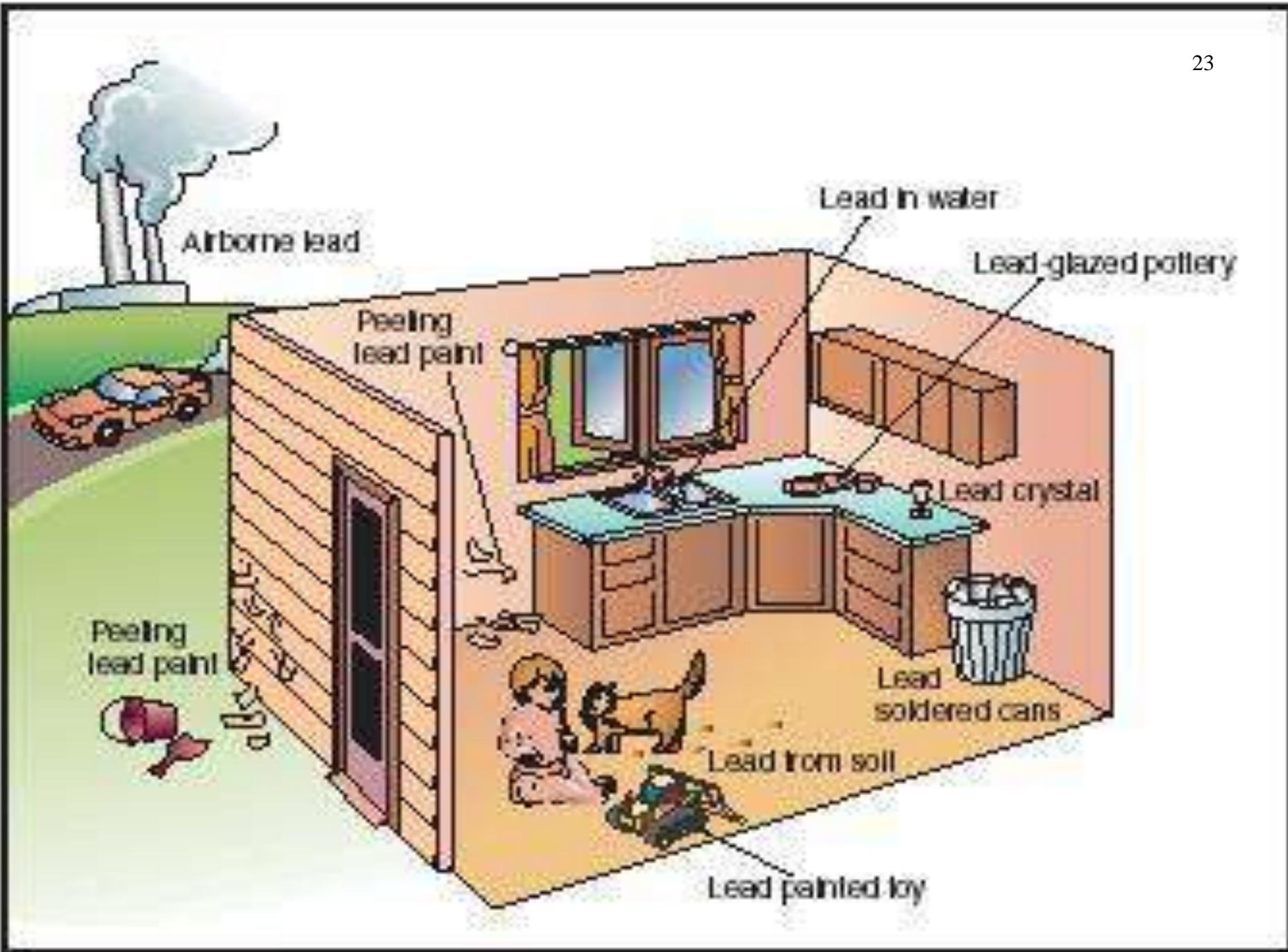
Uneasy Stomach  
Poor Appetite  
Weight Loss  
Reproductive Problems

# Later Symptoms of Lead Poisoning

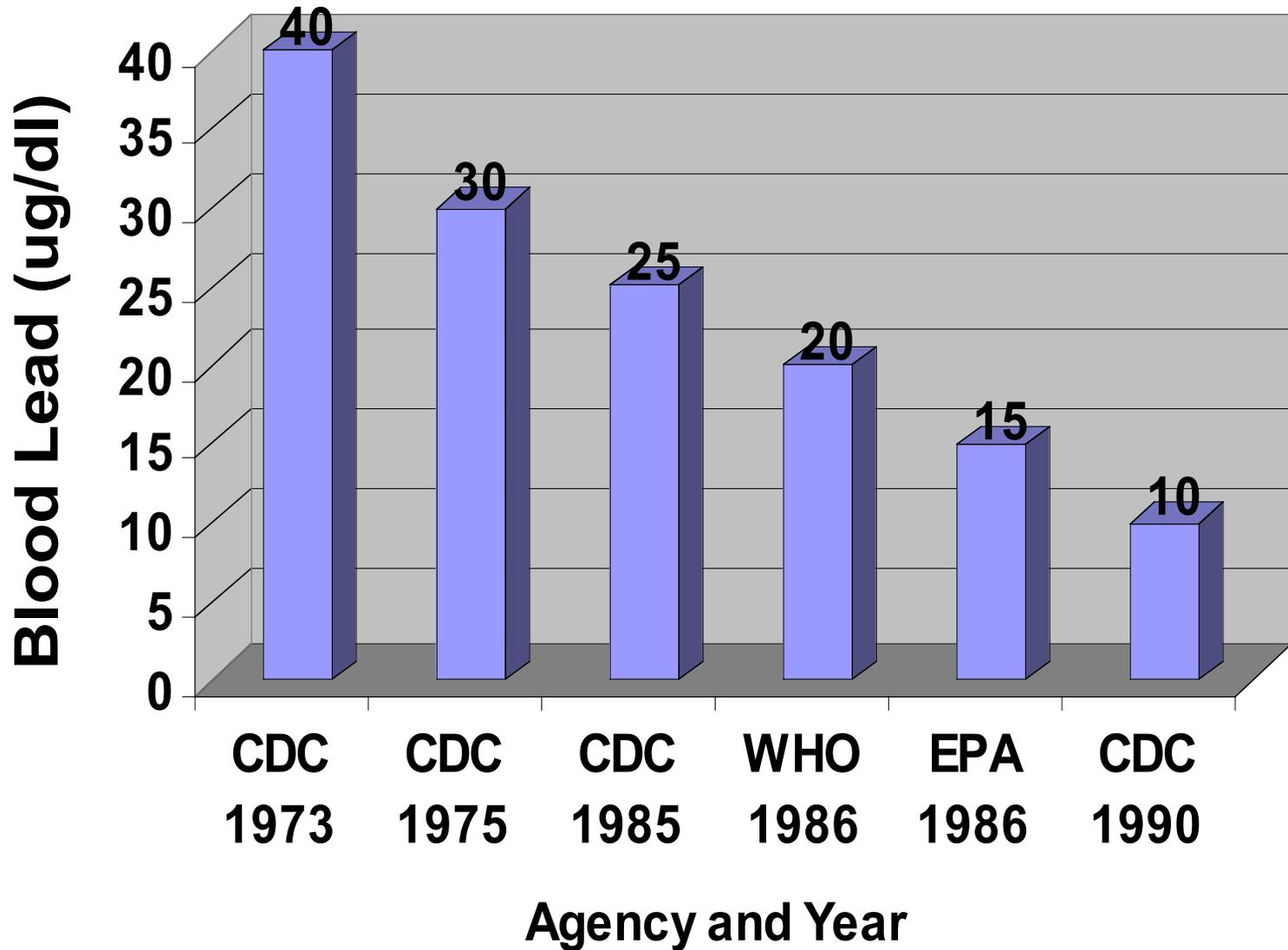
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22





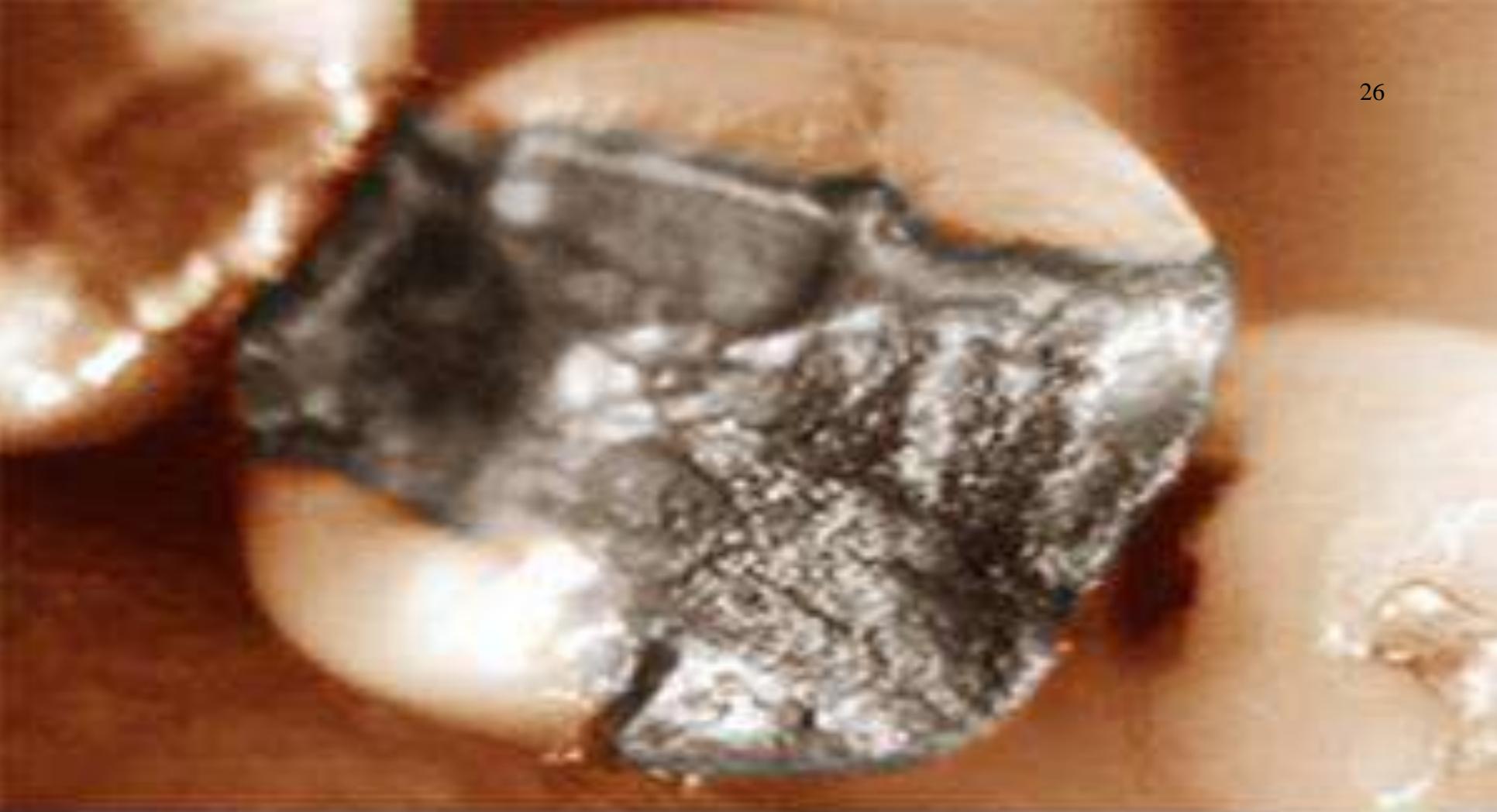
# Acceptable Childhood Blood Lead Levels



**Hg** Mercury

Atomic Number: 80

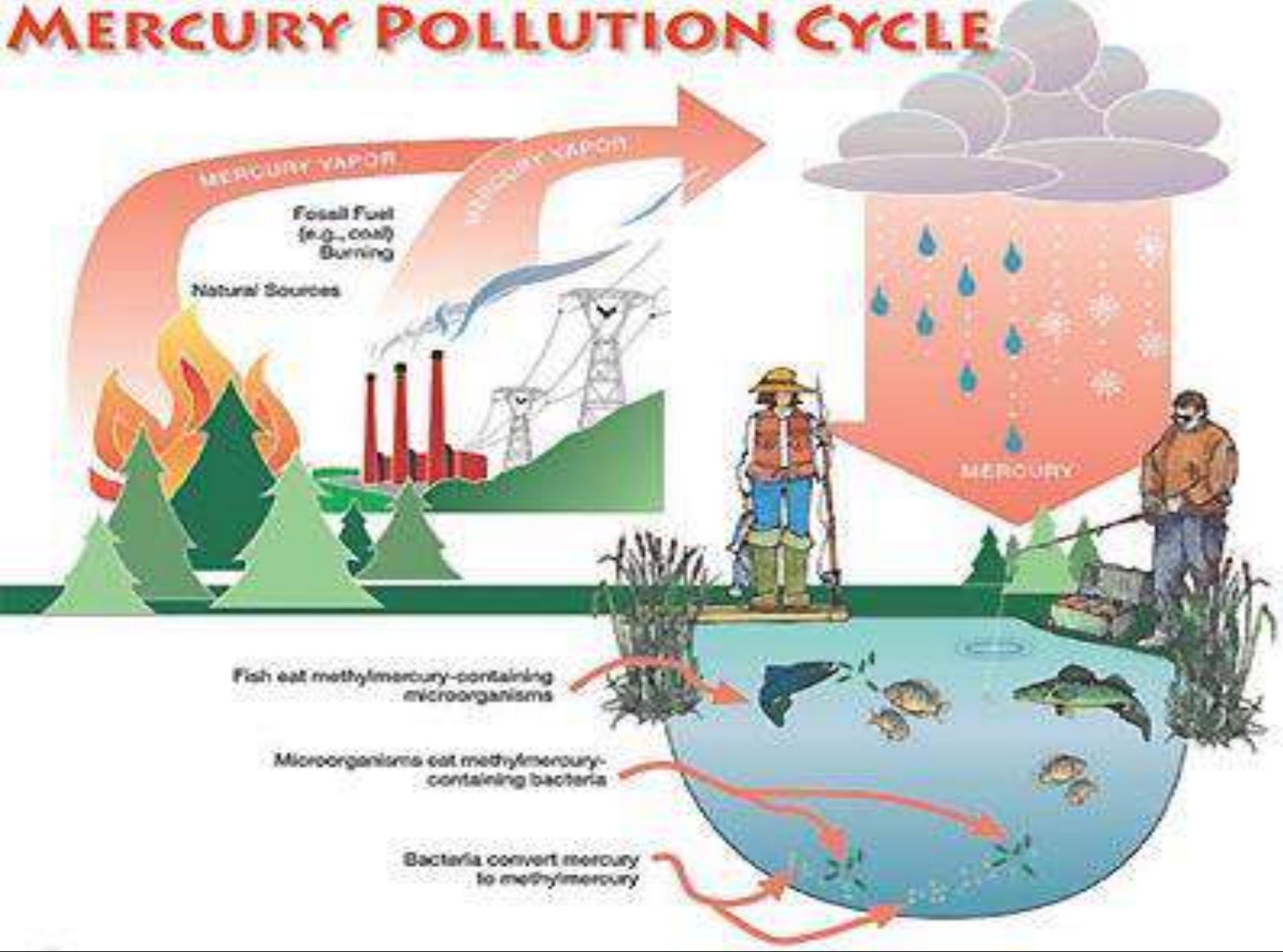
Atomic Mass: 200



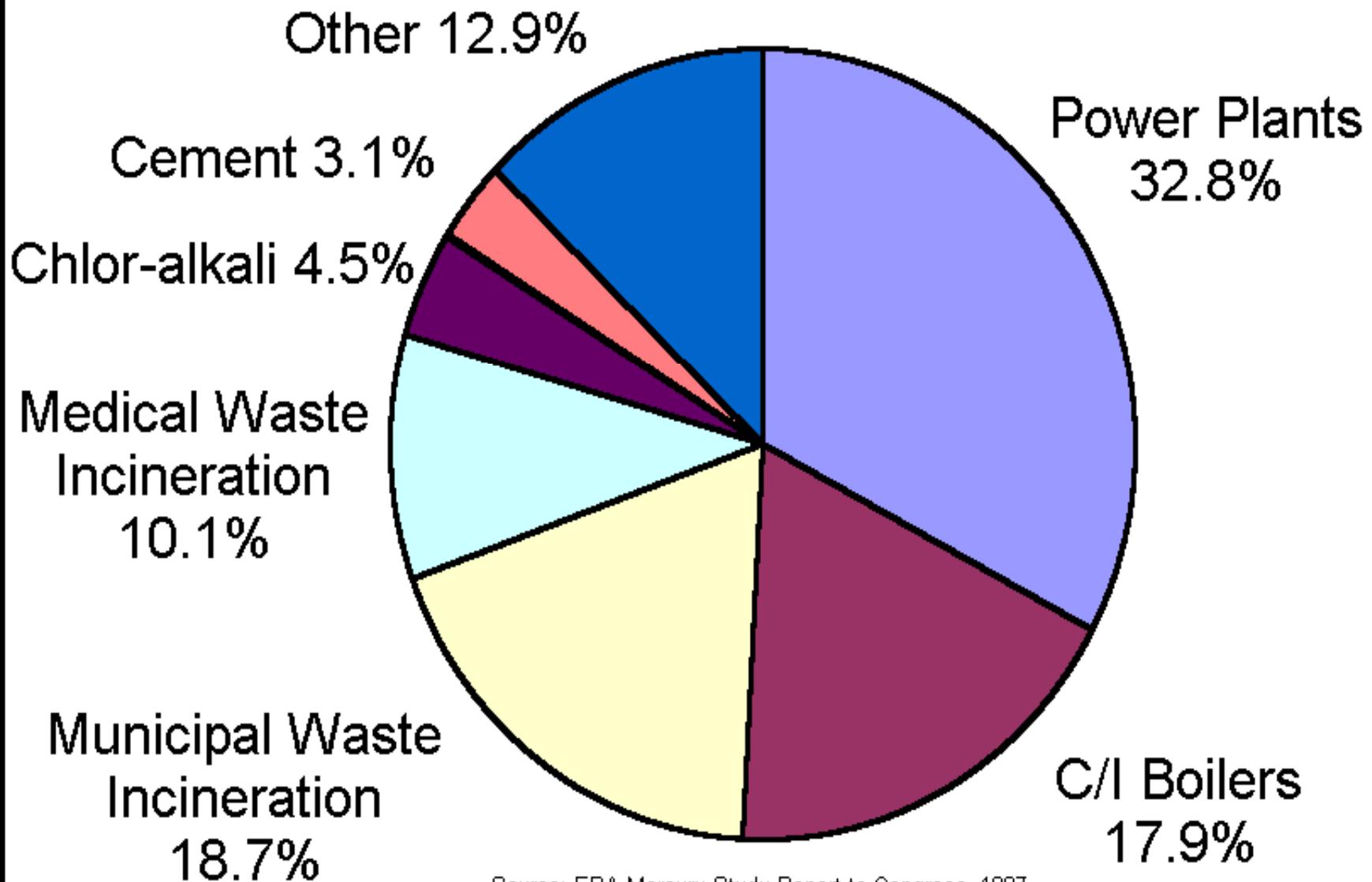
# *Mercury Poisoning*

The Truth About Silver Fillings

# MERCURY POLLUTION CYCLE



# Mercury Emissions



Source: EPA Mercury Study Report to Congress, 1997



- Some chemicals or their breakdown products (metabolites) lodge in our bodies for only a short while before being excreted, but continuous exposure to such chemicals can create a "persistent" body burden.

- \* Arsenic, for example, is mostly excreted within 72 hours of exposure.

- Other chemicals can remain for years in our blood, adipose (fat) tissue, semen, muscle, bone, brain tissue, or other organs.

- \* Chlorinated pesticides, such as DDT, can remain in the body for 50 years.

# DO ALL HUMANS CARRY THIS CHEMICAL BODY BURDEN?



- Scientists estimate that everyone alive today carries within her or his body at least 700 contaminants, most of which have not been well studied.



**FACT:** In 2005, over 280 toxic chemicals were found in the blood of newborn babies.

So, the question we must ask ourselves is not IF we are toxic, but **HOW TOXIC ARE WE?**

- Some of the chemicals residing in our bodies are pesticides, and some are used in or produced by other forms of industrial production.
- Many are found in a wide variety of consumer products.



## **BodyBurden**

### **The Pollution in Newborns**

A benchmark investigation of industrial chemicals, pollutants, and pesticides in human umbilical cord blood



- Humans are exposed to chemicals through the food we eat, the air we breathe, and the water we drink and bathe in.
- Chemicals often coat the surface of dust particles, which we handle or inhale.

**Viktor Yushchenko** Medical experts believe the dramatic facial transformation of Ukrainian opposition leader Viktor Yuschenko was caused by dioxin poisoning. These two photographs of him have been merged to show the shocking changes.



PHOTO MONTAGE

Left side:  
Picture taken  
June 30, 2004

Right side:  
Picture taken  
Nov. 1, 2004

REUTERS PHOTOS: Gleb Garanich (left side);  
Vasily Fedosenko (right side)

**EFFECTS OF DIOXIN ON THE HUMAN BODY**

**CHLORACNE**

Starts with excessive skin oiliness, leading to whiteheads, blackheads and cysts. Skin may thicken, flake, peel and scar.

**HYPERPIGMENTATION**

Change in skin color.

**HYPERKERATOSIS**

Verruca-like scales in armpits, knees, elbows and groin.

**SEBACEOUS CYSTS**

Inflamed fat and oil-producing glands in the skin.

**OTHER EFFECTS**

**Conjunctivitis:** Eye infections

**Thyroid:** Disrupted hormones

**Reproduction:** Lowered sperm count, heart disease, liver damage, cancers, nerve damage.

- Contaminated dust is an especially important route of exposure for children who commonly put their hands into their mouths.
- We are also exposed to hundreds of chemicals in everyday products we use.
- Paints and varnishes, gasoline, glues, cosmetics, clothes dry-cleaned with solvents, plastic food containers, and home and garden pesticides are just a few examples.



- Another source of exposure is the chemical body burden of our mothers.
- During pregnancy, the chemicals stored in a woman's body have the ability to cross the placenta where they may cause harm.

## Inherited Pollution:

A mother's pollution lingers in her daughter's body for years.

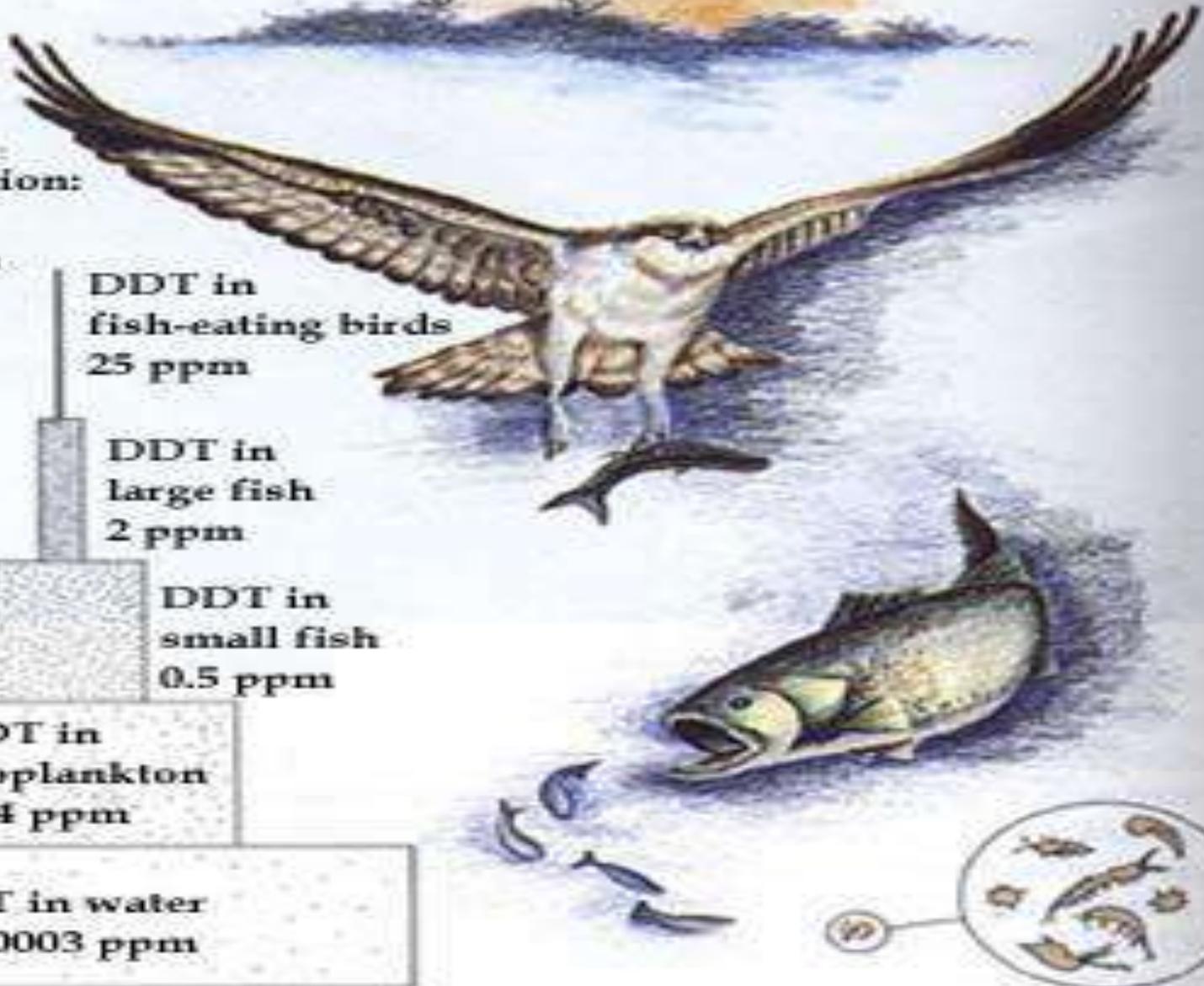
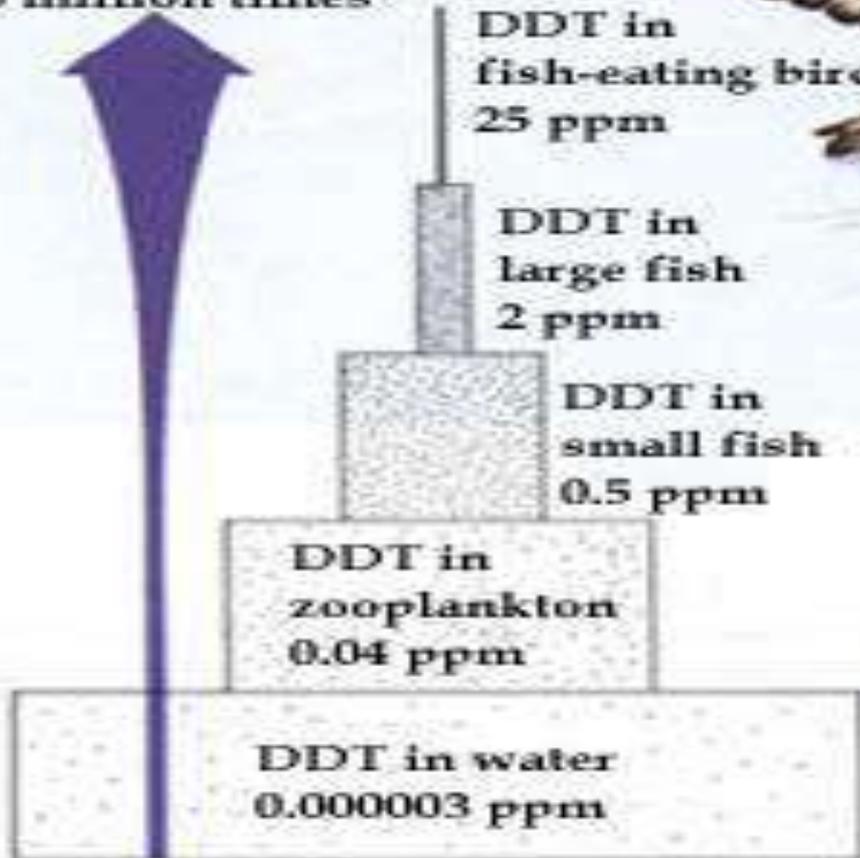


- Some chemicals from a mother's body are also mobilized and transferred to the breasts as she produces breast milk. These chemicals are then transferred to the baby during breastfeeding.
- **Breast milk remains the best food for babies**, as recent studies show, because of its immunological, nutritional and psychological benefits.
- **The fact that industrial chemicals have contaminated breast milk is tragic.**

# WHAT IS THE EVIDENCE FOR BODY BURDEN?

- In 1944 researchers found residues of DDT in human fat, and in the early 50's, naturalists rightly concluded that DDT was directly responsible for thinning eggshells and declining populations of bald eagles and other birds.
- In fact, at about the same time, DDT was detected in Antarctic penguins living an extremely long distance from where DDT was being used.

DDT concentration:  
increase of  
10 million times



# WHAT ARE THE HEALTH EFFECTS OF THIS BODY BURDEN?

- Chemicals can have different effects in people or in wildlife, depending on the amount, timing, duration, and pattern of exposure as well as the properties of the specific chemical.
- Chemicals can have toxic effects through a variety of mechanisms.

- Some chemicals attack the genetic material in the nucleus of a cell, causing damage directly to the DNA, which may create an inheritable defect that is passed on to the next generation.
- This can lead to gene mutations, which can set in motion a sequence of events leading to cancer, birth defects, developmental or reproductive disorders.



Andrew Locke / MSNBC

- Deo, the 17-year old daughter of the Nguyen family in the Cam Lo district in Vietnam, suffers from spina bifida.
- Her neighborhood was heavily sprayed with Agent Orange during the war.

- Chemicals that cause cancer are called **carcinogens**.
- Chemicals that cause birth defects are called **teratogens**.
- Chemicals that damage the normal development of the fetus, infant, or child, or damage our reproductive tissues are called **developmental/reproductive toxicants**.
- Some chemicals can cause damage through their ability to interfere with normal hormone function. These chemicals are called **endocrine disrupters**.

- Fetal exposure to polychlorinated biphenyls (PCBs) is related to behavioral and cognition problems.
- DDT exposure has been related to women's inability to produce sufficient breast milk.
- The immune systems of children in some areas of the far north are unable to produce enough antibodies to make vaccinations effective.



- Fetal exposure to mercury causes attention, memory, and learning problems later in life.
- Brain development is also impaired in fetuses and infants exposed to lead.

# ARE THERE SPECIAL HEALTH EFFECTS FOR CHILDREN?



- Developing or immature tissues are far more susceptible to chemical exposures than adult tissues.
- Development is a time of special vulnerability.
- It is a time of very rapid replication and differentiation of cells - the latter being an incredibly complex and vulnerable process.

- This means that the developing fetus, infant, or child may suffer harmful impacts from relatively small exposures that have no measurable impacts on adults.
- Fetal exposures to chemicals in amounts that are safe for adults may result in birth defects or abnormal brain development.
- For this reason, it is not only the amount of the exposure that is important, but the timing of the exposure.

- Hormones play extremely important roles as they help to direct the development of the fetus, infant, and child.
- Most importantly, exposure to an endocrine disrupter at a low level during a critical time in development can have lifelong impacts.

- For example, the developing fetus may mistake a foreign chemical for a hormone, and this may, in turn, cause an incorrect "signal" to be sent to developing tissues.
- These early mistakes can permanently damage the baby's developing immune, reproductive or nervous systems.
- Most of the confirmed evidence of the importance of endocrine disruptors comes from wildlife studies, but more recently, evidence for impacts in humans has also emerged.

# CAN THE LINKS BETWEEN BODY BURDEN AND ILLNESS BE PROVEN?

- Of the more than 80,000 chemicals in commerce, only a small percentage of them have ever been screened for even one potential health effect, such as cancer, reproductive toxicity, developmental toxicity, or impacts on the immune system.
- Among the approximately 15,000 tested, few have been studied enough to correctly estimate potential risks from exposure.

# AT THE WHAT-YOU-DON'T-KNOW-CAN'T-HURT-YOU FOOD PROCESSING COMPANY HQ:

NO, THIS IS NOT LIKE GUANTANAMO WHERE UNLAWFUL ENEMY COMBATANTS ARE FORCE-FED FOR THEIR OWN GOOD ...

... WE JUST DON'T WANT TO SPOIL YOUR APPETITE BY DISCLOSING EVERY LITTLE THING THAT GOES INTO YOUR FOOD, THAT'S ALL; OPEN WIDE!

NATIONAL UNIFORMITY FOR FOOD ACT



YOU HAVEN'T TOUCHED YOUR CHEMICAL SOUP!!

U.S. CONSUMER



# HOW CAN I GET THESE CHEMICALS OUT OF MY BODY?

- At this time there is no general agreement about useful or safe methods for reducing body burdens.
- The best course is long-term prevention.

Contamination of future generations by toxic chemicals can be prevented by working together to:

- 1) eliminate the most dangerous persistent chemicals that bioaccumulate (concentrate more as they get higher in the food chain);
- 2) develop alternative production methods that use non-toxic materials, and
- 3) ensure that communities, national governments and international agencies take a precautionary approach when it comes to chemicals released into our air, water, and soil.

- Some limited research shows that body burdens of some contaminants stored in fat can be lowered by a combination of special diets, exercise, and saunas. But data are very limited and preliminary.
- When some metals, like lead or mercury, are present in the body at fairly high levels, "chelating agents" are sometimes used to lower the total body burden of that particular metal.
- However, "chelation" treatments are somewhat controversial with potential side effects and have not been proven to consistently reduce toxic impacts of exposure.

# DON'T GOVERNMENT REGULATIONS PROTECT MY FAMILY AND ME?

- U.S. regulations are the result of long, involved political processes in which special interests exert considerable influence.
- Industries with significant financial interest in the continued use of a particular product or chemical have historically been quite successful in limiting regulatory controls.

- The regulations now in place are not designed to look at exposures in the context of the full burden of chemicals we carry.
- No one is looking at the health effects of the cumulative total.

# TOXICOLOGY AND GOVERNMENT

- **FDA – Food and Drug Administration ([www.fda.gov](http://www.fda.gov))**
- **EPA – Environmental Protection Agency ([www.epa.gov](http://www.epa.gov))**
- **OSHA - Occupational Safety and Health Administration ([www.osha.gov](http://www.osha.gov))**
- **CDC - Centers for Disease Control and Prevention ([www.cdc.gov](http://www.cdc.gov))**
- **CPSC - Consumer Product Safety Commission ([www.cpsc.gov](http://www.cpsc.gov))**

# REFERENCE:

- [www.chemicalbodyburden.org](http://www.chemicalbodyburden.org)
- [www.ewg.org](http://www.ewg.org)
- [www.ourstolenfuture.org](http://www.ourstolenfuture.org)
- [www.pollutioninpeople.org](http://www.pollutioninpeople.org)

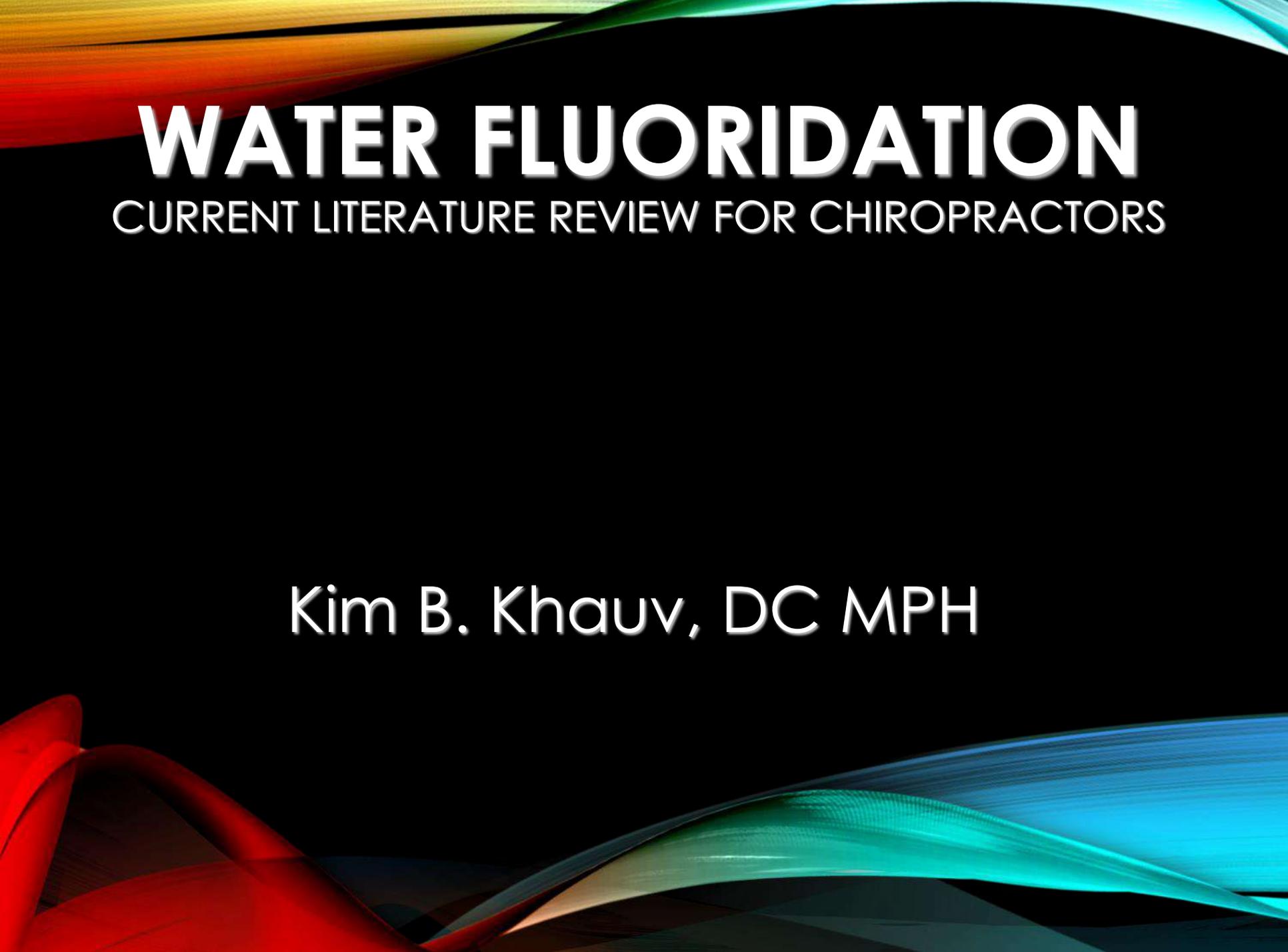
# ADDITIONAL INFO

## ➤ References

- Casarett & Doull's Toxicology, The Basic Science of Poisons
- Michael Kamrin, Toxicology: A Primer on Toxicology Principles and Applications

## ➤ Web Sites

- Society of Toxicology  
([www.toxicology.org](http://www.toxicology.org))



# **WATER FLUORIDATION**

CURRENT LITERATURE REVIEW FOR CHIROPRACTORS

Kim B. Khauv, DC MPH

# OVERVIEW

- WHAT IS FLUORIDE?
- WHAT NATURAL PROCESS CAN FORM FLUORIDE?
- WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?
- HOW DOES FLUORIDE HARM ANIMALS?
- WHAT DISEASES RESULT FROM EXPOSURE TO FLUORIDE ARE IN HUMANS?
- ARE THERE ALTERNATIVES TO FLUORIDE?

# WHAT IS FLUORIDE?

- Substance Name -- Fluorine (soluble fluoride)  
CASRN -- 7782-41-4  
Primary Synonym -- Fluoride  
Last Revised -- 01/31/1987
- 7782-41-4  
Fluoride  
Fluoride ion  
Fluoride ion(1-)  
Fluorine  
Fluorine, ion  
Hydrofluoric acid, ion(1-)  
Perfluoride.

**Electronegativity**

0.7 4 18



**Pauling scale**

|           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
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| H<br>2.1  | 2         |           |           |           |           |           |           |           |           |           |           | 13        | 14        | 15        | 16        | 17        | He<br>..  |
| Li<br>1.0 | Be<br>1.5 |           |           |           |           |           |           |           |           |           |           | B<br>2.0  | C<br>2.5  | N<br>3.0  | O<br>3.5  | F<br>4.0  | Ne<br>..  |
| Na<br>0.9 | Mg<br>1.2 | 3         | 4         | 5         | 6         | 7         | 8         | 9         | 10        | 11        | 12        | Al<br>1.5 | Si<br>1.8 | P<br>2.1  | S<br>2.5  | Cl<br>3.0 | Ar<br>..  |
| K<br>0.8  | Ca<br>1.0 | Sc<br>1.3 | Ti<br>1.5 | V<br>1.6  | Cr<br>1.6 | Mn<br>1.5 | Fe<br>1.8 | Co<br>1.8 | Ni<br>1.8 | Cu<br>1.9 | Zn<br>1.6 | Ga<br>1.6 | Ge<br>1.8 | As<br>2.0 | Se<br>2.4 | Br<br>2.8 | Kr<br>3.0 |
| Rb<br>0.8 | Sr<br>1.0 | Y<br>1.2  | Zr<br>1.4 | Nb<br>1.6 | Mo<br>1.8 | Tc<br>1.9 | Ru<br>2.2 | Rh<br>2.2 | Pd<br>2.2 | Ag<br>1.9 | Cd<br>1.7 | In<br>1.7 | Sn<br>1.8 | Sb<br>1.9 | Te<br>2.1 | I<br>2.5  | Xe<br>2.6 |
| Cs<br>0.7 | Ba<br>0.9 | La<br>1.1 | Hf<br>1.3 | Ta<br>1.5 | W<br>1.7  | Re<br>1.9 | Os<br>2.2 | Ir<br>2.2 | Pt<br>2.2 | Au<br>2.4 | Hg<br>1.9 | Tl<br>1.8 | Pb<br>1.9 | Bi<br>1.9 | Po<br>2.0 | At<br>2.2 | Rn<br>..  |
| Fr<br>0.7 | Ra<br>0.9 | Ac<br>1.1 | Rf<br>..  | Db<br>..  | Sg<br>..  | Bh<br>..  | Hs<br>..  | Mt<br>..  | Uun<br>.. | Uuu<br>.. | Uub<br>.. | 113<br>.. | Uuq<br>.. | 115<br>.. | 116<br>.. | 117<br>.. | 118<br>.. |

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|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Ce<br>1.1 | Pr<br>1.1 | Nd<br>1.1 | Pm<br>1.2 | Sm<br>1.2 | Eu<br>1.1 | Gd<br>1.2 | Tb<br>1.2 | Dy<br>1.2 | Ho<br>1.2 | Er<br>1.2 | Tm<br>1.2 | Yb<br>1.2 | Lu<br>1.3 |
| Th<br>1.3 | Pa<br>1.5 | U<br>1.7  | Np<br>1.3 | Pu<br>1.3 | Am<br>1.3 | Cm<br>1.3 | Bk<br>1.3 | Cf<br>1.3 | Es<br>1.3 | Fm<br>1.3 | Md<br>1.3 | No<br>1.5 | Lr<br>..  |

'Electronegativity' is a measure of the attraction that an **atom** has for the bonding pair of electrons in a **covalent bond**. Fluorine has the highest electronegativity of all the elements.



## WHAT IS FLUORIDE?

Fluorides are naturally occurring compounds. Low levels of fluorides can help prevent dental cavities. At high levels, fluorides can result in tooth and bone damage. Hydrogen fluoride and fluorine are naturally-occurring gases that are very irritating to the skin, eyes, and respiratory tract. These substances have been found in at least 188 of the 1,636 National Priorities List sites identified by the Environmental Protection Agency (EPA).

CDC: Agency for Toxic Substances and Diseases Registry  
<http://www.atsdr.cdc.gov/facts11.html>

# ATSDR

AGENCY FOR TOXIC SUBSTANCES  
AND DISEASE REGISTRY

## WHAT NATURAL PROCESS CAN FORM FLUORIDE?

- Fluorine cannot be destroyed in the environment; it can only change its form. Fluorine forms salts with minerals in soil.
- Hydrogen fluoride gas will be absorbed by rain and into clouds and fog to form hydrofluoric acid, which will fall to the ground.
- Fluorides released to the air from volcanoes and industry are carried by wind and rain to nearby water, soil, and food sources.
- Fluorides in water and soil will form strong associations with sediment or soil particles.
- Fluorides will accumulate in plants and animals. In animals, the fluoride accumulates primarily in the bones or shell rather than in soft tissues.

# UNITED STATES RECOMMENDED DIETARY ALLOWANCES (RDA)

RECOMMENDED DIETARY ALLOWANCES: NATIONAL ACADEMY OF SCIENCES;10TH ED.,

1989

| Compound              | units      | Adult               | Adult                           | Children      | Infants        | Pregnant         | Lactating+       |
|-----------------------|------------|---------------------|---------------------------------|---------------|----------------|------------------|------------------|
|                       |            | Males<br>(25+years) | Females<br>(25+years)           | 4-8 years     | 6-12 mos       |                  |                  |
| <b>Calcium (Ca)</b>   | <b>mg</b>  | <b>1200*</b>        | <b>1200*</b>                    | <b>800*</b>   | <b>270*</b>    | <b>1000*</b>     | <b>1000*</b>     |
| <b>Chloride (Cl)</b>  | <b>mg</b>  | <b>750</b>          | <b>750</b>                      | <b>600</b>    | <b>300</b>     | <b>750</b>       | <b>750</b>       |
| <b>Chromium (Cr)</b>  | <b>mcg</b> | <b>50-200</b>       | <b>50-200</b>                   | <b>50-200</b> | <b>20-60</b>   | <b>50-200</b>    | <b>50-200</b>    |
| <b>Copper (Cu)</b>    | <b>mg</b>  | <b>1.5-3</b>        | <b>1.5-3</b>                    | <b>2-Jan</b>  | <b>0.6-0.7</b> | <b>1.5-3</b>     | <b>1.5-3</b>     |
| <b>Fluoride (F)</b>   | <b>mg</b>  | <b>4*</b>           | <b>3*</b>                       | <b>1*</b>     | <b>0.5*</b>    | <b>3*</b>        | <b>3*</b>        |
| <b>Folate</b>         | <b>mcg</b> | <b>400*</b>         | <b>400*</b>                     | <b>200*</b>   | <b>80*</b>     | <b>600*</b>      | <b>500*</b>      |
| <b>Iodine(I)</b>      | <b>mcg</b> | <b>150</b>          | <b>150</b>                      | <b>120</b>    | <b>50</b>      | <b>175</b>       | <b>200</b>       |
| <b>Iron (Fe)</b>      | <b>mg</b>  | <b>10</b>           | <b>(25-50y)<br/>15(51+y) 10</b> | <b>10</b>     | <b>10</b>      | <b>30</b>        | <b>15</b>        |
| <b>Magnesium (Mg)</b> | <b>mg</b>  | <b>420**</b>        | <b>320**</b>                    | <b>130**</b>  | <b>75*</b>     | <b>350-400**</b> | <b>310-360**</b> |

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?

TOOTHPASTE (DENTRIFICE)



# WARNING LABEL FOUND ON FLUORIDE TOOTHPASTE

## Active ingredients

Sodium fluoride 0.24% (0.14% w/v fluoride ion).....  
Triclosan 0.30%.....

## Purpose

Anticavity  
Antigingivitis

## Uses

aids in the prevention of:  
· cavities · plaque · gingivitis

## Toothpaste Warning Label

## Warnings

Keep out of the reach of children under 6 years of age.

If more than used for brushing is accidentally swallowed, get medical help or contact a Poison Control Center right away.

Ask a dentist before use if you have

- bleeding or redness lasting more than 2 weeks
- pain, swelling, pus, loose teeth, or more spacing between teeth

These may be signs of periodontitis, a serious form of gum disease.

NET WT 6.0 OZ (170 g)

STOOKEY GK, BEISWANGER BB. TOPICAL FLUORIDE THERAPY. IN: HARRIS NO, CHRISTEN AG, EDS. PRIMARY PREVENTIVE DENTISTRY. 4TH ED. STAMFORD, CT: APPLETON & LANG, 1995:193--233.

## ***Fluoride Paste***

Fluoride-containing paste is routinely used during dental prophylaxis (i.e., cleaning). **The abrasive paste, which contains 4,000--20,000 ppm fluoride**, might restore the concentration of fluoride in the surface layer of enamel removed by polishing, but it is not an adequate substitute for fluoride gel or varnish in treating persons at high risk for dental caries (151). Fluoride paste is not accepted by FDA or ADA as an efficacious way to prevent dental caries.

# TOOTHPASTE (DENTRIFICE)

**Total fluoride intake and implications for dietary fluoride supplementation. Levy SM, Guha-Chowdhury N. (1999). *Journal of Public Health Dentistry* 59: 211-23.**

**"Virtually all authors have noted that some children could ingest more fluoride from dentrifice alone than is recommended as a total daily fluoride ingestion."**

**Fluoride ingestion from toothpaste by young children Bentley  
EM, Ellwood RP, Davies RM BRITISH DENTAL JOURNAL 186 (9):  
460-462 MAY 8 1999**

“The mean amount of **fluoride** ingested per brushing, was 0.42 mg when using the 1,450 ppm F toothpaste and 0.10 mg, when using the 400 ppm F toothpaste...If using the 400 ppm F toothpaste twice daily no children of average weight would have exceeded ingestion of 0.05 mg F/kg body weight whereas 14 average weight children would have exceeded this value if using the 1450 ppm F toothpaste.

**Conclusions: It is essential that parents of children aged less than 7 years apply a small (Pea-sized) amount of fluoride toothpaste on the toothbrush and discourage swallowing.”**

“The mean weight of dentifrice, and therefore **fluoride**, applied was statistically less for the smear instruction than the pea but the difference was small. Significantly less weight of Colgate 0-6 gel was applied when compared with Colgate Great Regular Flavour (GRF) but the nozzle shape had no significant effect on the weight of dentifrice applied.

Conclusions: The difference in **fluoride** concentration between GRF (1450 ppm F) and Colgate 0-6 gel (400 ppm F) was the most important determinant of the amount-of **fluoride** applied.”

# CDC: RECOMMENDATIONS FOR USING FLUORIDE TO PREVENT AND CONTROL DENTAL CARIES IN THE UNITED STATES

## Fluoride Mouthrinse

- “Fluoride mouthrinse is a concentrated solution intended for daily or weekly use. The most common fluoride compound used in mouthrinse is sodium fluoride. Over-the-counter solutions of 0.05% sodium fluoride (230 ppm fluoride) for daily rinsing are available for use by persons aged >6 years. Solutions of 0.20% sodium fluoride (920 ppm fluoride) are used in supervised, school-based weekly rinsing programs. Throughout the 1980s, approximately 3 million children in the United States participated in school-based fluoride mouthrinsing programs (39).
- Although no studies of enamel fluorosis associated with use of fluoride mouthrinse have been conducted, **studies of the amount of fluoride swallowed by children aged 3--5 years using such rinses indicated that some young children might swallow substantial amounts (191).**

TABLE 1: Comparison of Daily Fluoride Ingestion from Toothpaste

with Recommended Total Daily Intake (0.05 mg/kg/day)\*

| Age<br>(Avg wt**)   | Average F Intake from<br>Toothpaste Alone  |                               | Maximum F Intake from<br>Toothpaste Alone  |                               | Reference        |
|---------------------|--|-------------------------------|--|-------------------------------|------------------|
|                     | Intake from<br>2 Brushings<br>(1000 ppm F) | % of<br>Recommended<br>Intake | Intake from<br>2 Brushings<br>(1000 ppm F) | % of<br>Recommended<br>Intake |                  |
| 2<br>(12.05 kg)     | 0.66 mg<br>0.055 mg/kg/day                 | <b>110%</b>                   | n/a  | n/a                           | Naccahe '87 +    |
| 2 1/2<br>(14.2 kg)  | 0.54 mg<br>0.038 mg/kg/d                   | <b>76%</b>                    | 1.66 mg<br>0.12 mg/kg/d                    | <b>240%</b>                   | Bentley '99      |
| 3-Feb<br>(13.2 kg)  | 0.56 mg<br>0.042 mg/kg/d                   | <b>84%</b>                    | n/a  | n/a                           | Simard '84 +     |
| 4-Feb<br>(12.6 kg)  | 0.6 mg<br>0.048 mg/kg/d                    | <b>96%</b>                    | >1.46 mg<br>>0.12 mg/kg/d                  | <b>240%</b>                   | Barnhart '76 +   |
| 6-Mar<br>(17.25 kg) | 0.76 mg<br>0.44 mg/kg/d                    | <b>88%</b>                    | 2.32 mg<br>0.13 mg/kg/d                    | <b>260%</b>                   | Hargreaves '75 + |
| 3<br>(14.35 kg)     | 0.36 mg<br>0.025 mg/kg/d                   | <b>50%</b>                    | n/a  | n/a                           | Naccahe '85 +    |
| 4<br>(16.35 kg)     | 0.78 mg<br>0.05 mg/kg/d                    | <b>100%</b>                   | n/a  | n/a                           | Simard '84 +     |
| 4<br>(16.35 kg)     | 0.26 mg<br>0.016 mg/kg/d                   | 32%                           | 0.6 mg<br>0.04 mg/kg.d                     | <b>80%</b>                    | Ericsson '74 +   |
| 5<br>(18.2 kg)      | 0.44 mg<br>0.24 mg/kg/d                    | 48%                           | n/a  | n/a                           | Simard '84 +     |

\* Recommended Daily Intake (0.05 mg/kg/day) from Institute of Medicine's 1997 report: "Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride."

\*\* Average weight data from: [http://www.webhealthcentre.com/general/yc\\_hwchart.asp](http://www.webhealthcentre.com/general/yc_hwchart.asp)

+ Data cited in: Levy SM, Guha-Chowdhury N. (1999). Total fluoride intake and implications for dietary fluoride supplementation. *Journal of Public Health Dentistry* 59: 211-23.



# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?

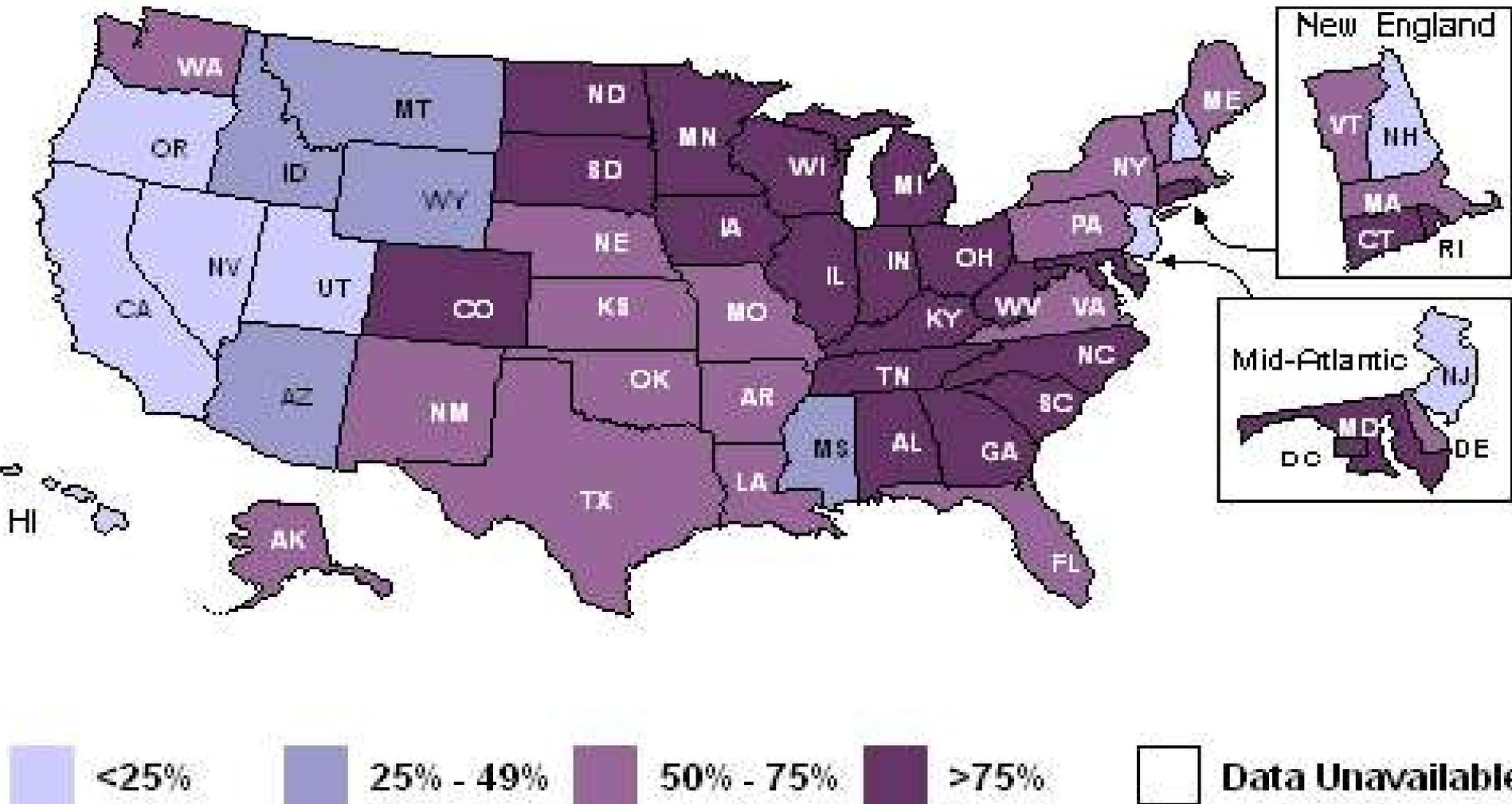
FLUORIDATED TAP WATER

**TEN GREAT PUBLIC HEALTH  
ACHIEVEMENTS –  
UNITED STATES, 1900-1999**

- Vaccination
- Motor-vehicle safety
- Safer workplaces
- Control of infectious diseases
- Decline in deaths from coronary heart disease and stroke
- Safer and healthier foods
- Healthier mothers and babies
- Family planning
- **Fluoridation of drinking water**
- Recognition of tobacco use as a health hazard

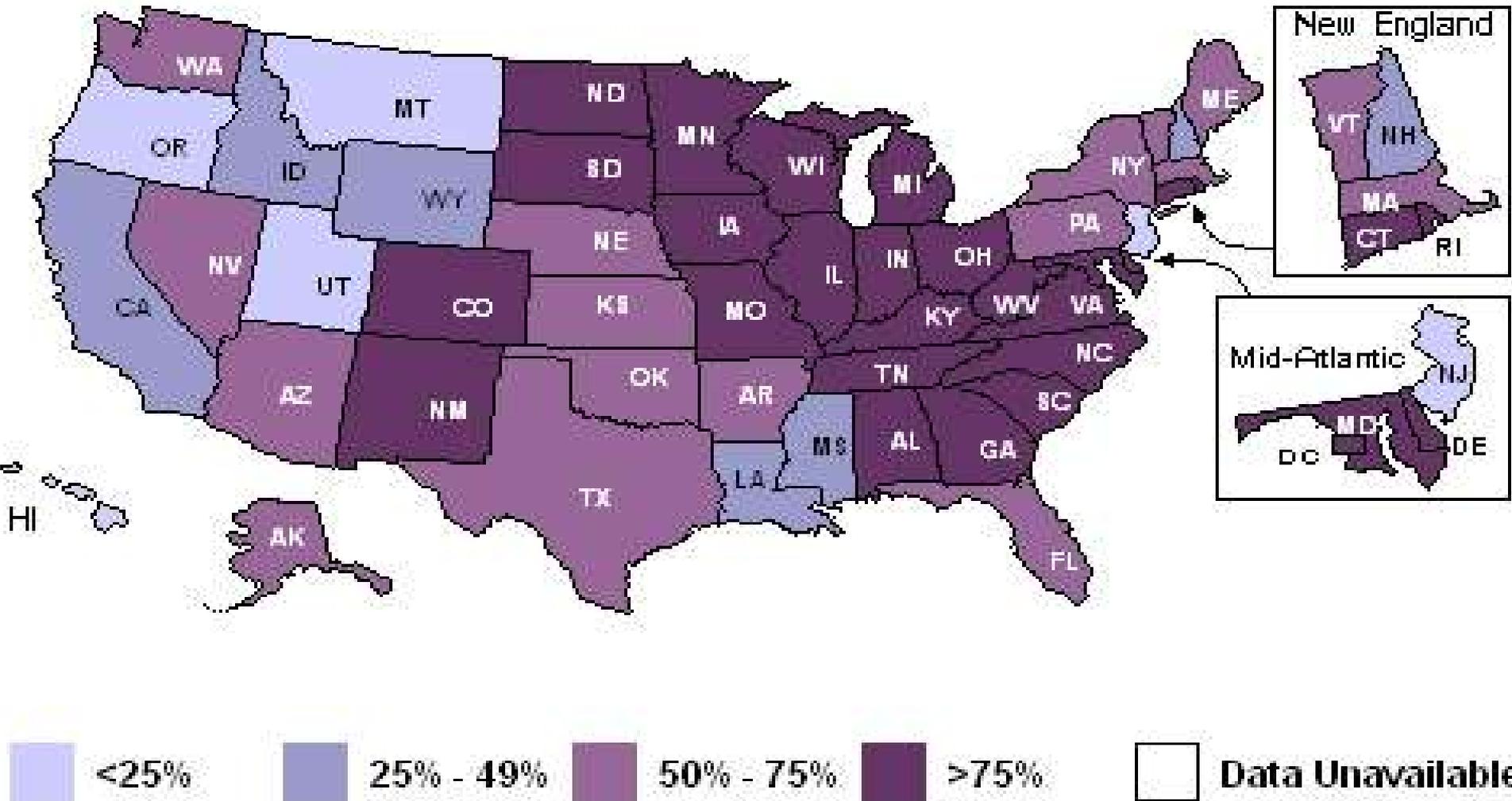
**Fluoridation of drinking water began in 1945 and in 1999 reaches an estimated 144 million persons in the United States.** Fluoridation safely and inexpensively benefits both children and adults by effectively preventing tooth decay, regardless of socioeconomic status or access to care. Fluoridation has played an important role in the reductions in tooth decay (40%-70% in children) and of tooth loss in adults (40%-60%) (5).

# Percent of Population on Public Water Systems Receiving Fluoridated Water - 1992



Source: Fluoridation Census 1992

# Percent of Population on Public Water Systems Receiving Fluoridated Water - 2002



Source: Water Fluoridation Reporting System 2002



**Does water fluoridation really  
work in reducing dental caries?**

**FLUORIDES AND THE DECLINE IN TOOTH-DECAY IN NEW-ZEALAND**  
**COLQUHOUN J; FLUORIDE 26 (2): 125-134 APR 1993**

“National data collected in New Zealand over a 50-year period indicate that **the decline in tooth decay in that country commenced before and independently of the introduction of fluoridation and other uses of fluoride...** The recent decline in permanent tooth decay has been slightly steeper in nonfluoridated areas.”

**Influence of social class and fluoridation on child dental health.**  
**Colquhoun J. Community Dent Oral Epidemiol. 1985 Feb;13(1):37-41.**

“In this study in oral epidemiology, officially collected statistics are presented which show that, 15 yr after fluoridation commenced in Auckland, New Zealand, there was still a significant correlation between dental health of children and their social class. **They also show that treatment levels have continued to decline in both fluoridated and unfluoridated areas, and are related to social class factors rather than to the presence or absence of water fluoridation.**

In both areas the use of fluoride tooth-pastes and oral hygiene had been encouraged. **When the socioeconomic variable is allowed for, child dental health appears to be better in the unfluoridated areas.”**

Dental caries and dental fluorosis at varying water fluoride concentrations  
Heller KE, Eklund SA, Burt BA JOURNAL OF PUBLIC HEALTH DENTISTRY 57  
(3): 136-143 SUM 1997

“In addition to fluoridated water, the use of fluoride supplements was associated with both fewer caries and increased fluorosis. Conclusions: **A suitable trade-off between caries and fluorosis appears to occur around 0.7 ppm F.** Data from this study suggest that a reconsideration of the policies concerning the most appropriate concentrations for water fluoridation might be appropriate for the United States.”

**“The prevalence of dental fluorosis in the United States has increased during the last 30 years, both in communities with fluoridated water and in communities with nonfluoridated water.”**

**FLUORIDE INTAKE AND PREVALENCE OF DENTAL FLUOROSIS: TRENDS IN FLUORIDE INTAKE WITH SPECIAL ATTENTION TO INFANTS. *JOURNAL OF PUBLIC HEALTH DENTISTRY* 60(3):131-9. FOMON SJ, EKSTRAND J, ZIEGLER EE. (2000).**

"During the past 40 years dental caries has been declining in the US, as well as in most other developed nations of the world... **The decline in dental caries has occurred both in fluoride and in fluoride-deficient communities,** lending further credence to the notion that modes other than water fluoridation, especially dentrifices, have made a major contribution."

Leverett DH. (1991). Appropriate uses of systemic fluoride: considerations for the '90s. *Journal of Public Health Dentistry* 51: 42-7.

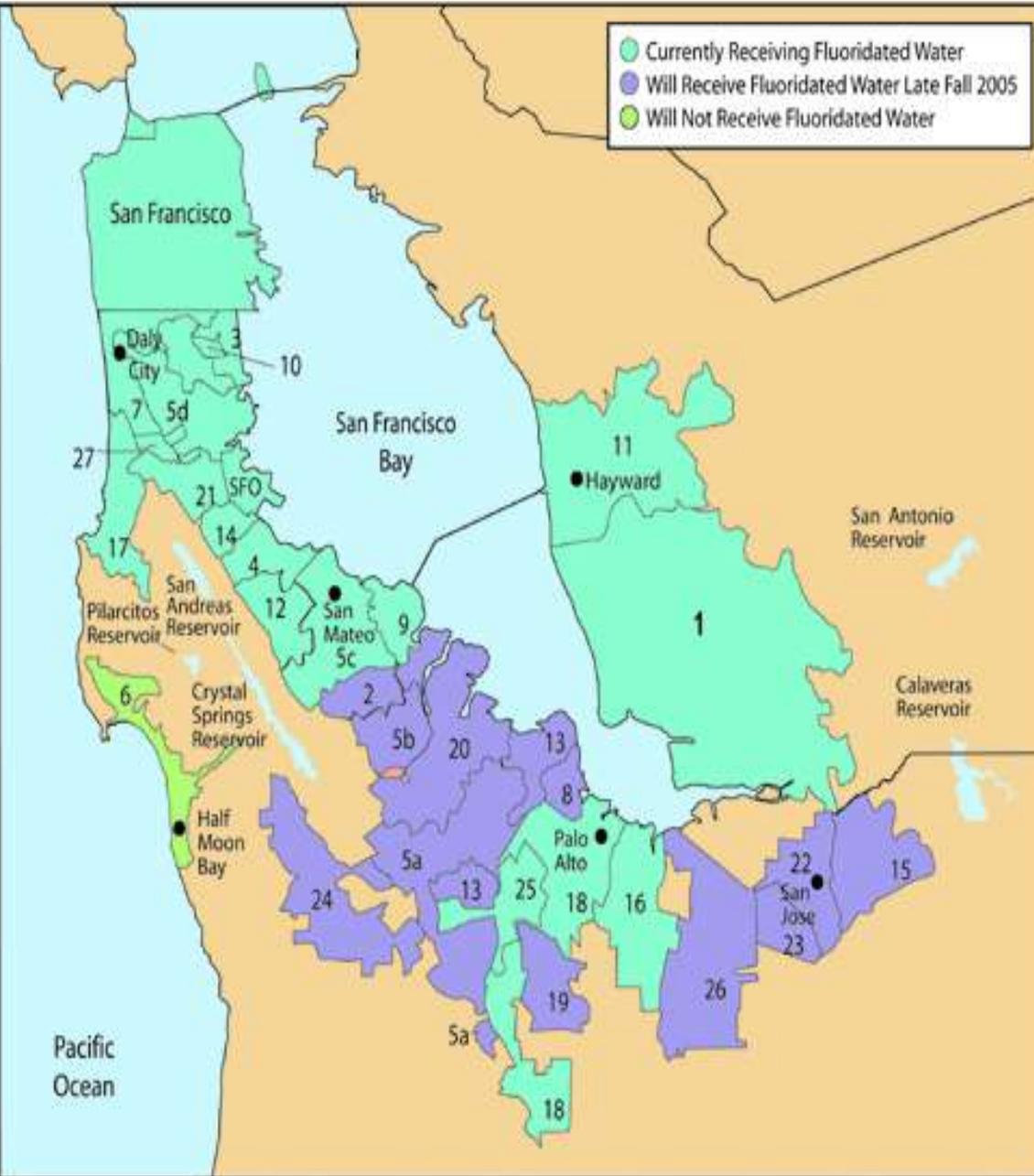
SAMPLE OF COMMUNITIES REJECTING FLUORIDATION SINCE 1990 (COMPLETE LIST AT: [HTTP://WWW.FLUORIDEALERT.ORG/COMMUNITIES.HTM](http://www.fluoridealert.org/communities.htm))

|                                      |                         |
|--------------------------------------|-------------------------|
| Santa Barbara, California            | 23-Nov-99               |
| Johnstown, New York                  | 19-Nov-99               |
| Tooele, Utah                         | 2-Nov-99                |
| Wichita, Kansas                      | 26-Oct-99               |
| Boca Raton, Florida                  | 25-Oct-99               |
| El Carjon, California                | 27-Apr-99               |
| Escondido, California                | 7-Apr-99                |
| Helix Water District, California     | 7-Apr-99                |
| Lakeside Water District, California  | 6-Apr-99                |
| Hutchinson, Kansas                   | 30-Mar-99               |
| Riverview Water District, California | 24-Mar-99               |
| La Mesa, California                  | 9-Mar-99                |
| Santa Cruz, California               | March 4, 1999 ...banned |
| Bremerton, California                | 2-Feb-99                |
| Olympia, Washington                  | 15-Dec-99               |
| Seward, Nebraska                     | 3-Nov-98                |

On November 1, 2005, the San Francisco Public Utilities Commission's (SFPUC) 2.4 million customers --except for those in Half Moon Bay-- will receive drinking water with fluoride. This is part of an overall effort by the SFPUC to fluoridate the remaining 20% of its customer service area. The SFPUC has supplied fluoridated water to San Francisco residents and the majority of its wholesale customers since the early 1950's.

[http://sfwater.org/detail.cfm/C\\_ID/2614/MC\\_ID/10/MSC\\_ID/51/MTO\\_ID/61](http://sfwater.org/detail.cfm/C_ID/2614/MC_ID/10/MSC_ID/51/MTO_ID/61)

# FLUORIDATION STATUS OF BAWSCA MEMBER AGENCIES

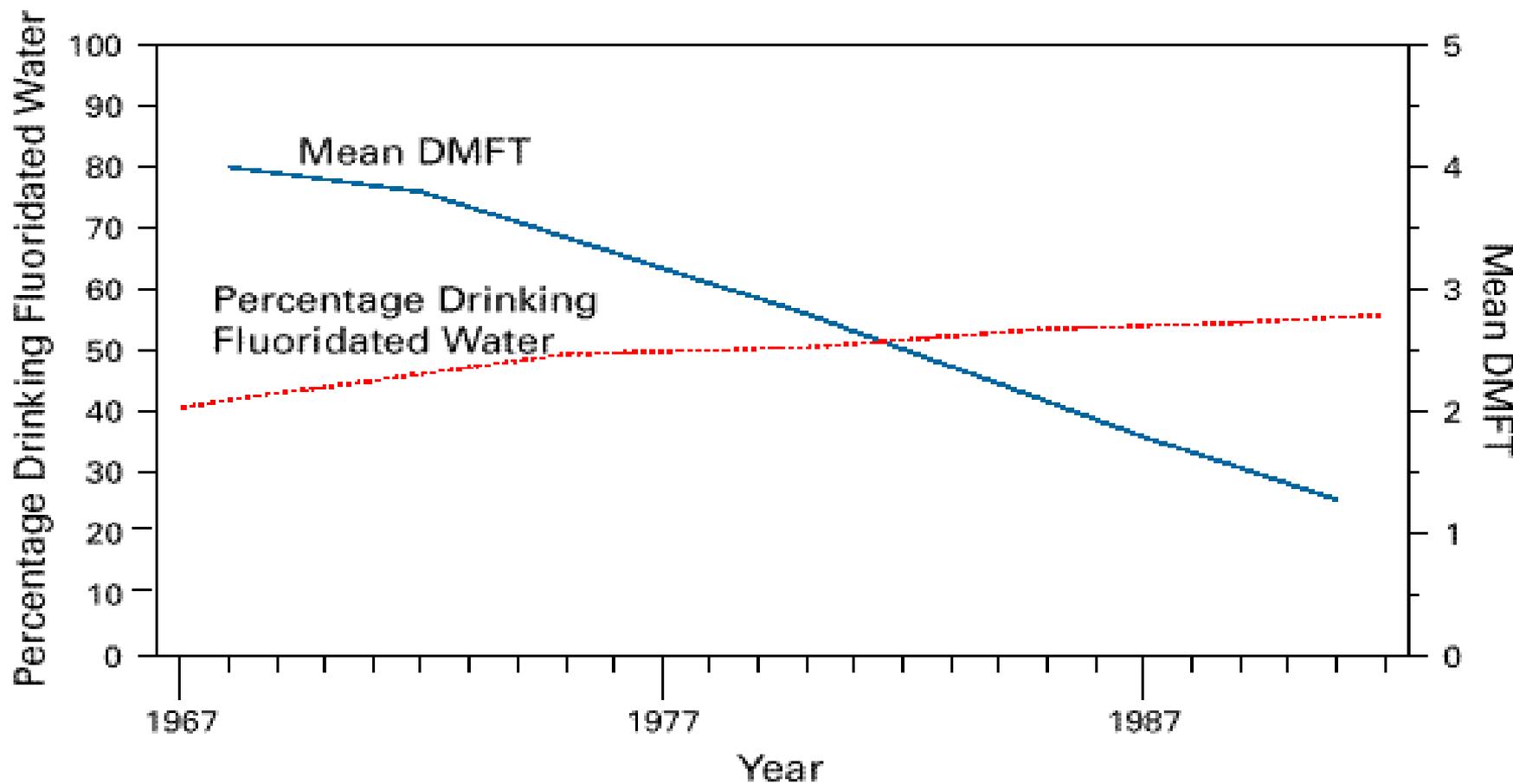


| Currently Receiving Fluoridated Water               |    |
|---|----|
| Alameda County Water District                       | 1  |
| City of Hayward                                     | 11 |
| City of Mountain View                               | 16 |
| City of Palo Alto                                   | 18 |
| Stanford University                                 | 25 |
| City of Brisbane                                    | 3  |
| City of Burlingame                                  | 4  |
| Cal Water Service Co. - Mid Peninsula (San Mateo)   | 5c |
| Cal Water Service Co. - City of South San Francisco | 5d |
| City of Daly City                                   | 7  |
| Estero Municipal Improvement District               | 9  |
| Guadalupe Valley Municipal Improvement District     | 10 |
| Town of Hillsborough                                | 12 |
| City of Millbrae                                    | 14 |
| North Coast County Water District                   | 17 |
| City of San Bruno                                   | 21 |
| Westborough Water District                          | 27 |
| Will Receive Fluoridated Water Late Fall 2005       |    |
| Mid Peninsula Water District (Belmont)              | 2  |
| Cal Water Service Co. - Bear Gulch                  | 5a |
| Cal Water Service Co. - Mid Peninsula (San Carlos)  | 5b |
| East Palo Alto County Water District                | 8  |
| City of Menlo Park                                  | 13 |
| City of Milpitas                                    | 15 |
| Purissima Hills Water District                      | 19 |
| City of Redwood City                                | 20 |
| City of San Jose - North                            | 22 |
| City of Santa Clara                                 | 23 |
| Skyline County Water District                       | 24 |
| City of Sunnyvale                                   | 26 |
| Will Not Receive Fluoridated Water                  |    |
| Coastside County Water District                     | 6  |

Note: Lawrence Livermore Laboratory is an Associate Member

**Proponents of Water Fluoridation will show this graph.  
Centers for Disease Control (1999) -  
Tooth Decay in the U.S. vs Fluoridation Status:**

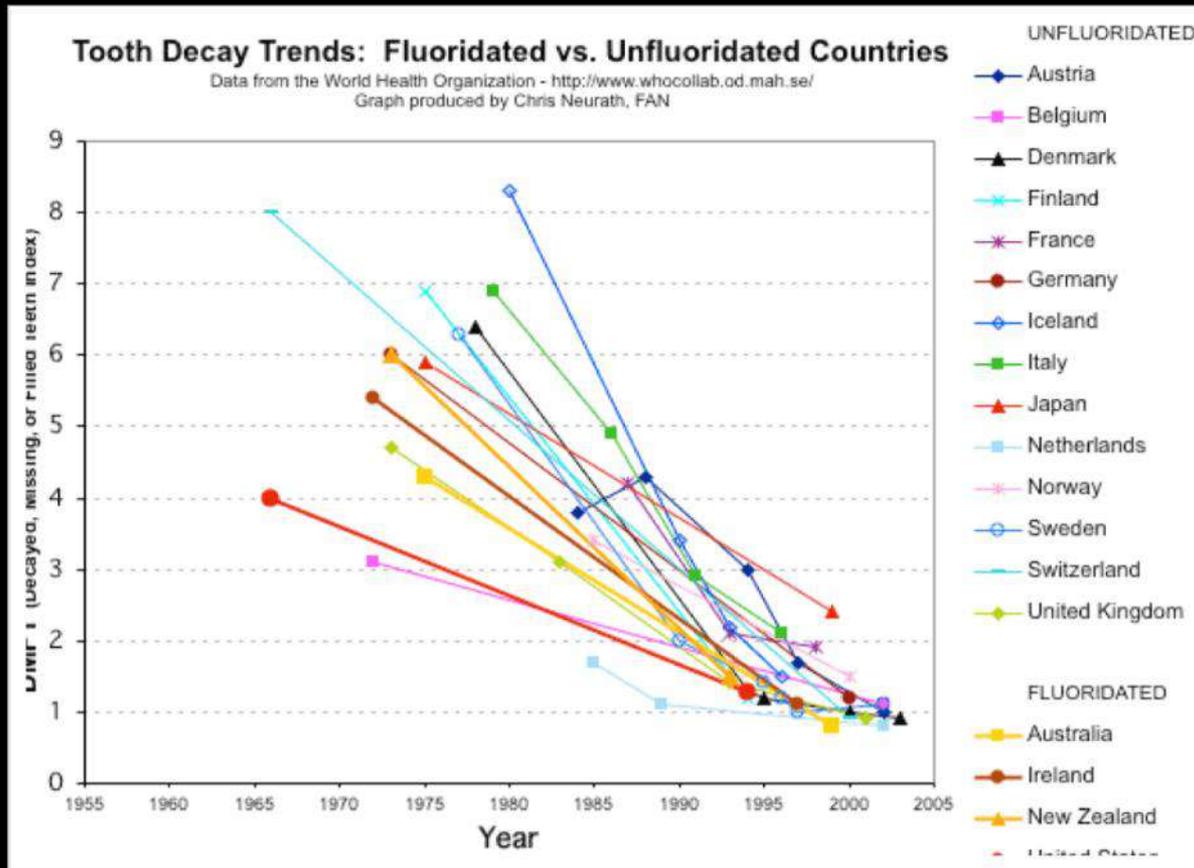
**FIGURE 1. Percentage of population residing in areas with fluoridated community water systems and mean number of decayed, missing (because of caries), or filled permanent teeth (DMFT) among children aged 12 years — United States, 1967–1992**



But then you can show them this graph.

World Health Organization Data (2004) -

Tooth Decay Trends (12 year olds) in Fluoridated vs. Unfluoridated Countries:



"The current reported decline in caries tooth decay in the US and other Western industrialized countries has been observed **in both fluoridated and nonfluoridated communities**, with percentage reductions in each community apparently about the same."

Heifetz SB, et al. (1988). Prevalence of dental caries and dental fluorosis in areas with optimal and above-optimal water-fluoride concentrations: a 5-year follow-up survey. *Journal of the American Dental Association* 116: 490-5.

## Study Indicates Too Much Fluoride Can Be Bad

reuters

- WASHINGTON (March 22) - Fluoride in drinking water -- long controversial in the United States when it is deliberately added to strengthen teeth -- can damage bones and teeth, and federal standards fail to guard against this, the National Academy of Sciences reported on Wednesday....
- The Environmental Working Group, a non-profit watchdog organization, applauded the academy's report for raising health concerns about excessive fluoride in drinking water.
- "The bottom line from the nation's top voice on science is that you can protect your children's teeth by brushing them and you can protect their bones by getting rid of fluoride in tap water," Tim Kropp, the group's senior scientist, said in an e-mail.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



Bottled Water

**DANNON**

**Fluoride**  
*to go*



**GREAT FOR KIDS  
ON THE GO!**



**DANNON**

**Fluoride**  
*to go*

FLUORIDATED  
SPRING WATER



**8.5 OZ.  
8 PACK**

8-255 mL BOTTLES (2L)

8-8.5 FL OZ BOTTLES (68 FL OZ)

**130. Mark AM. Americans taking to the bottle: loss of important fluoride source may be result. ADA News 1998;29:12.**

**<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm#tab3>**

## **Bottled Water.**

- Although some bottled waters marketed in the United States contain an optimal concentration of fluoride (approximately 1.0 ppm), most contain <0.3 ppm fluoride (127--129).
- For water bottled in the United States, current FDA regulations require that fluoride be listed on the label only if the bottler adds fluoride during processing; the concentration of fluoride is regulated but does not have to be stated on the label (Table 3).
- Few bottled water brands have labels listing the fluoride concentration.

**TABLE 3. U.S. Food and Drug Administration (FDA) fluoride requirements for bottled water packaged in the United States**

| Annual average of maximum daily air temperature (F) where the bottled water is sold at retail | Maximum fluoride concentration (mg/L) allowed in bottled water |                                 |
|---|--|---------------------------------|
|   | No fluoride added to bottled water                             | Fluoride added to bottled water |
| <53.7   | 2.4  | 1.7                             |
| 53.8–58.3   | 2.2  | 1.5                             |
| 58.4–63.8   | 2  | 1.3                             |
| 63.9–70.6   | 1.8  | 1.2                             |
| 70.7–79.2   | 1.6  | 1                               |
| 79.3–90.5   | 1.4  | 0.8                             |

**Note:** FDA regulations require that fluoride be listed on the label only if the bottler adds fluoride during processing; the bottler is not required to list the fluoride concentration, which might or might not be optimal. FDA does not allow imported bottled water with no added fluoride to contain >1.4 mg fluoride/L or imported bottled water with added fluoride to contain >0.8 mg fluoride/L.

**Source:** US Department of Health and Human Services, Food and Drug Administration. 21 CFR Part 165.110. Bottled water. Federal Register 1995;60:57124–30.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?

INFANT FORMULA



**"Infant formulas reconstituted with higher fluoride water can provide 100 to 200 times more fluoride than breast milk, or cows milk."**

Total fluoride intake and implications for dietary fluoride supplementation. Levy SM, Guha-Chowdhury N. (1999). *Journal of Public Health Dentistry* 59: 211-23.

**“In the 1960s, most infants over 4 months of age were fed fresh cow's milk and intakes of F were therefore low. By the mid 1970s a trend toward more extended feeding of formula was evident and this trend has continued into the 1990s. Prolonged exposure to high intakes of fluoride during infancy is much more common now than in the past.”**

Fluoride intake by infants Fomon SJ, Ekstrand J *JOURNAL OF PUBLIC HEALTH DENTISTRY* 59 (4): 229-234 FAL 1999



# **NO EVIDENCE OF TRANSFER OF FLUORIDE FROM PLASMA TO BREAST-MILK**

**EKSTRAND J, BOREUS LO, DECHATEAU P BRITISH MEDICAL JOURNAL 283 (6294):  
761-762 1981**

"Parents should therefore be advised that they may be able to protect their children from dental fluorosis by breastfeeding their infant and by extending the duration for which they breastfeed. **When infants are formula-fed, parents should be advised to reconstitute or dilute infant formula with deionized water (reverse osmosis, distilled, or low-fluoride bottled water) in order to reduce the amount of systemically ingested fluoride.**"

- Brothwell D, Limeback H. (2003). Breastfeeding is protective against dental fluorosis in a nonfluoridated rural area of Ontario, Canada. *Journal of Human Lactation* 19: 386-90.

**"Breastfeeding of infants should be encouraged, both for the many documented, general health benefits and the relative protection against ingestion of excessive fluoride from high quantities of intake of fluoridated water used to reconstitute concentrated infant formula early in infancy."**

- Levy SL, et al. (1995). Sources of fluoride intake in children. *Journal of Public Health Dentistry* 55: 39-52.

# **WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?**



**PROCESSED CEREALS**

**“Food processing often concentrates fluoride and foods processed with fluoridated water typically have higher fluoride concentrations than foods processed with non-fluoridated water... A study that found marked differences between cereals processed in fluoridated and non-fluoridated areas showed that **cereals processed in a fluoridated area had fluoride concentrations ranging from 3.8 ppm to 6.3 ppm...**”**

- Warren JJ, Levy SM. (2003). Current and future role of fluoride in nutrition. *Dental Clinics of North America* 47: 225-43.

- “During manufacturing, infant dry cereals are processed in a slurry and placed in a revolving drying drum.
- The water from the slurry evaporates, and the fluoride from the water remains in the cereal.
- Thus, the fluoride concentration of the water used during processing can substantially affect the final fluoride concentration...
- **Infants who eat large quantities of dry infant cereals reconstituted with fluoridated water could ingest substantial quantities of fluoride from this source.”**

- Heilman JR, et al. (1997). Fluoride concentrations of infant foods. *Journal of the American Dental Association* 128(7):857-63.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



Juices  
&  
Sodas



"Our data suggest that **young children who regularly or frequently drink substantial quantities of juice possibly should not receive dietary fluoride supplements**, since they might be at increased risk of developing dental fluorosis."

- Kiritsy MC, et al. (1996). Assessing fluoride concentrations of juices and juice-flavored drinks. ***Journal of the American Dental Association*** 127(7):895-902.

**"Seventy-one percent of the [sodas] had fluoride levels exceeding 0.60 ppm,** which is considered to contain sufficient fluoride so that dietary fluoride supplements are contraindicated."

- Heilman JR, et al. (1999). Assessing fluoride levels of carbonated soft drinks. *Journal of the American Dental Association* 130(11):1593-9.

"Schulz (1976) found that nearly all **soft drinks then manufactured in optimally fluoridated Baltimore (1.10 ppm) had fluoride concentrations of 0.8 ppm or greater.** Shannon (1977) tested soft drinks manufactured in Houston, Texas... He found that fluoride concentrations... **closely matched the fluoride concentrations of the bottling plants' water supplies.** –

Warren JJ, Levy SM. (1999). Systemic fluoride: Sources, amounts, and effects of ingestion. *Dental Clinics of North America* 43: 695-711.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



Tea

POTENTIAL EXPOSURE AND RISK OF FLUORIDE INTAKES FROM TEA DRINKS  
PRODUCED IN TAIWAN. LUNG SC, CHENG HW, FU CB. JOURNAL OF  
EXPOSURE SCIENCE AND ENVIRONMENTAL EPIDEMIOLOGY 4 APRIL 2007

Tea is the second most commonly consumed drink in the world. ...Lungjing, pouchong, tienguanyin, oolong, pureh, and black tea specimens were purchased from different counties in Taiwan. ...Among six kinds of tea, black tea had the highest fluoride concentrations (8.64+/-2.96 mg/l), whereas pureh (1.97+/-2.70 mg/l) had the lowest levels.. ...In addition, it was found that the critical step during the manufacturing process affecting the percentage of infusible fluoride was ball rolling rather than fermentation. Furthermore, intakes of high amounts ( $\geq 5$  l/week) of certain tea may result in excess risks of dental or skeletal fluorosis. Tea lovers could be exposed to excess fluoride and may be at risk of fluorosis.

**As the tea plant (*Camellia sinensis*) is known to accumulate fluoride from the soil, the tealeaves may contain high concentrations of fluoride, which is easily released during infusion.** In this study, we have tested the possible effect of original fluoride concentration in the water on the fluoride release from tea. Moreover, we wanted to test the possible capacity of tealeaves (commercially available tea) to absorb fluoride from high-fluoride water. In low-fluoride water, fluoride is easily released from tealeaves.

"Appropriate regulation of the **fluoride content of tea commodities should be an urgent matter for public food safety policy.**"

- **Cao J, et al. (2004).** Fluoride in newer tea commodities. *Fluoride* 37: 286-300.

"**Instant tea**, one of the most popular drinks in the United States, may be a source of harmful levels of fluoride... The researchers found that some regular strength preparations **contain as much as 6.5 parts per million (ppm) of fluoride, well over the 4 ppm maximum allowed in drinking water** by the Environmental Protection Agency."

- 'Potentially harmful fluoride levels found in some instant tea', *Washington University School of Medicine*, January 25, 2005.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?

## Wine & Beer



**"Analyses of nineteen California wines revealed fluoride concentrations ranging from 0.23 to 2.80 ppm (mean 1.02 ppm, with seven samples above the international limit of 1 ppm)."**

- Burgstahler AW, et al. (1997). Fluoride in California wines and raisins. *Fluoride* 30: 142-146.

"Researchers from California State University in Fresno conducted a 5 year study (1990-1994) on vineyards throughout the San Joaquin Valley. They found that '[m]ultiple applications of Cryolite during the growing season significantly increase fluoride in wines.' Notably they **found fluoride levels between 3 - 6 ppm in Zinfandel, Chardonnay, Cabernet Sauvignon, Chenin Blanc, Thompson Seedless, Barbera, Muscat Candi, Ruby Cabernet; and levels between 6 - <9 ppm in French Colombard and Zinfandel...** At 6 ppm one glass of wine (175 ml) would have delivered as much fluoride as about a liter of optimally fluoridated water!"

- Connett E, Connett P. (2001). Fluoride: The Hidden Poison in the National Organic Standards. *Pesticides and You* 21: 18-22.

**"Beers brewed in locations with high fluoride water levels may contribute significantly to the daily fluoride intake, particularly in alcohol misusing subjects and this may contribute to alcohol-associated bone disease."**

- Warnakulasuriya S, et al. (2002). Fluoride content of alcoholic beverages. *Clinica Chimica Acta* 320: 1-4.

**"Soda pop and beer bottled with fluoridated water contain 0.7 to 1 ppm fluoride; consumption of these beverages is almost certainly more variable among individuals than consumption of water... If beer contains 0.7 ppm fluoride, heavy beer-drinkers may ingest more than 4 mg daily from beer alone."**

- Groth, E. (1973), Two Issues of Science and Public Policy: Air Pollution Control in the San Francisco Bay Area, and Fluoridation of Community Water Supplies. Ph.D. Dissertation, Department of Biological Sciences, Stanford University, May 1973.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**MECHANICALLY  
DEBONED CHICKEN**

“Foods made with mechanically separated chicken have the potential to be a major contributor to total fluoride intake... **Fluoride contributed by foods made with mechanically separated chicken could increase the risk of mild dental fluorosis for children less than eight years** of age when combined with other sources of fluoride exposure.”

- Fein NJ, Cerklewski FL. (2001). Fluoride content of foods made with mechanically separated chicken. *Journal of Agricultural Food Chemistry* 49(9):4284-6.

“We found that infant foods containing chicken were high in fluoride. Thus, **any infants who regularly eat more than a couple of ounces of infant foods containing high-fluoride-content chicken would be at elevated fluorosis risk.**”

- Heilman JR, et al. (1997). Fluoride concentrations of infant foods. *Journal of the American Dental Association* 128(7):857-63.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**Fish/Seafood**

"Food categories with the highest mean fluoride levels were **fish [2.118 ppm]**, **beverages [1.148 ppm]**, and **soups [0.606 ppm]**. Individual samples with the highest fluoride levels were **tea [4.97 ppm]**, **canned fish [4.57 ppm]**, **shellfish [3.36 ppm]**, **cooked veal [1.23 ppm]**, and **cooked wheat cereal [1.02 ppm]**."

Agency for Toxic Substances and Disease Registry (ATSDR) (2001). *Toxicological Profile for Fluorides: Draft Profile for Public Comment*. U.S. Department of Health & Human Services, Public Health Service.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**Teflon  
Pans**

- Teflon is polytetrafluoroethylene (PTFE).
- Teflon has the lowest coefficient of friction of any solid material known to man. It is used as a non-stick coating for pans and other cookware.
- PTFE was discovered serendipitously by Roy Plunkett of DuPont in 1939, while attempting to make a new CFC refrigerant.
- DuPont patented it in 1941, and registered the Teflon trademark in 1944.

- **"Teflon-lined cookware may contribute to the fluoride ingested by humans.** Full and Parkins boiled fluoridated water at a moderate rate until a one-third or one-half reduction in volume was attained, then determined the fluoride content of the residual water...
- **In Teflon-coated ware, the concentration of fluoride ion increased to nearly 3 ppm."**

- Marier J, Rose D. (1977). *Environmental Fluoride*. National Research Council of Canada. Associate Committee on Scientific Criteria for Environmental Quality. NRCC No. 16081.

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**Fluoridated  
Salt**

Salt Fluoridation in Europe, comparisons with Latin America; Marthaler TM, Department of Preventive Dentistry, Periodontology and Cariology, Center of Dentistry, University of Zurich, Postfach, CH-8028 Zurich, Switzerland.

- “The use of fluoridated salt is becoming increasingly widespread across the globe.
- **Fluoridated salt usually contains about 250 ppm fluoride, which would result in a daily intake of 2.5 mg of fluoride per day for people consuming 10 grams of salt.**
- Countries with extensive salt fluoridation programs include: Austria, Bolivia, Columbia, Costa Rica, Dominican Republic, France, Germany, Honduras, Nicaragua, Panama, Switzerland, and Venezuela.”

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**ANAESTHETICS  
(Enflurane,  
Isoflurane &  
Sevoflurane)**

Nuscheler M, et al. (1996). [Fluoride-induced nephrotoxicity: fact or fiction?]. *Anaesthetist* 45 Suppl 1:S32-40.

"In the 1960s, the widespread use of the inhalational anaesthetic methoxyflurane was associated with a significant occurrence of postoperative renal dysfunction. This was attributed to hepatic biotransformation of methoxyflurane and subsequent release of inorganic fluoride ions into the circulation. **Based upon the clinical experience with methoxyflurane, serum fluoride concentrations exceeding 50  $\mu\text{mol/l}$  were considered to be nephrotoxic...** Enflurane and even isoflurane may, when used during prolonged operations, also yield anorganic fluoride levels in excess of 50  $\mu\text{mol/l}$ ."

Abdel-Latif, MM, et al. (2003). Serum fluoride ion and renal function after prolonged sevoflurane or isoflurane anaesthesia. *Egyptian Journal of Anaesthesia* 19: 79-83.

**After prolonged anaesthesia, metabolism of sevoflurane to inorganic fluoride is of a greater magnitude than that of isoflurane and exceeds the nephrotoxic threshold."**

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**Cigarettes**

Marier J, Rose D. (1977). *Environmental Fluoride*. National Research Council of Canada. Associate Committee on Scientific Criteria for Environmental Quality. NRCC No. 16081.

**"Cigarettes may be another significant source of fluoride intake by humans."**

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**Pesticides**

## SULFURYL FLUORIDE; PESTICIDE TOLERANCE

[FEDERAL REGISTER: JANUARY 23, 2004 (VOLUME 69, NUMBER 15)] [RULES AND REGULATIONS] [PAGE 3240-3257] FROM THE FEDERAL REGISTER ONLINE VIA GPO ACCESS [WAIS.ACCESS.GPO.GOV] [DOCID:FR23JA04-

6]

[HTTP://WWW.EPA.GOV/FEDRGSTR/EPA-PEST/2004/JANUARY/DAY-23/P1540.HTM](http://www.epa.gov/fedrgstr/epa-pest/2004/january/day-23/p1540.htm)

“In the Federal Register of February 15, 2002 (67 FR 7156) (FRL- 6822-2), EPA issued a notice pursuant to section 408 of FFDCA, 21 U.S.C. 346a, as amended by FQPA (Public Law 104-170), announcing the filing of a pesticide petition (PP 1F6312) by **Dow AgroScience LLC, 9330 Zionsville Road, Indianapolis, IN 46268**. That notice included a summary of the petition prepared by Dow AgroScience, the registrant. The petition requested that 40 CFR part 180 be **amended by establishing tolerances for residues of the insecticide sulfuryl fluoride and the metabolite fluoride, from sulfuryl fluoride postharvest use, in or on:**”

“

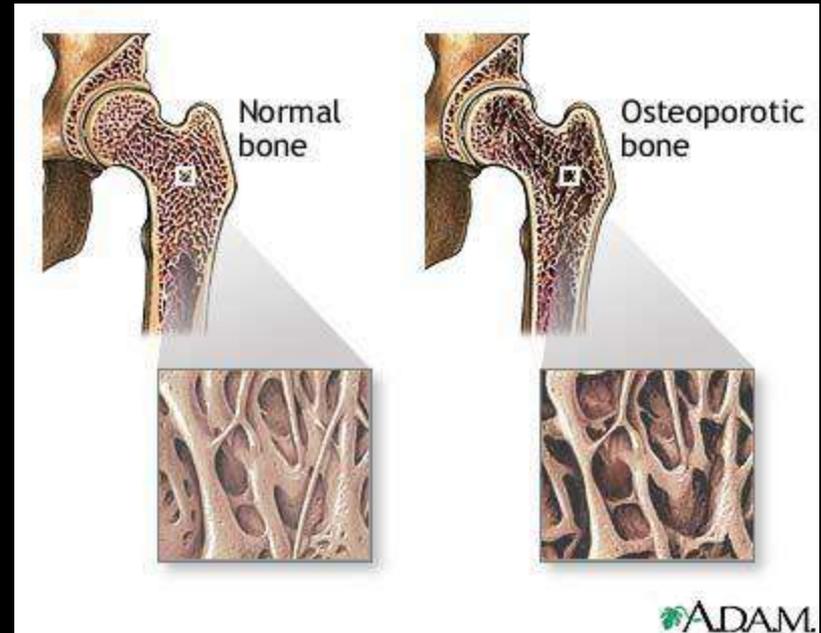
**1. Fluoride in or on the following raw agricultural commodities:** Date at 5 parts per million (ppm), fig at 5 ppm, plum, prune, dried at 5 ppm, grape, raisin at 5 ppm, fruit, dried at 5 ppm, almond at 10 ppm, pecan at 23 ppm, pistachio at 18 ppm, **walnut at 30 ppm**, beechnut; butternut; cashew; chestnut; chinquapin; filbert; nut, brazil; nut, hickory; and nut, **macadamia at 30 ppm**, barley, grain at 10 ppm, corn, field, grain; and corn, pop, grain at 7 ppm, oat, grain at 17 ppm, rice, grain at 10 ppm, **wheat, grain at 25 ppm**, millet, grain; rice, wild, grain; sorghum, grain; and triticale, grain at 25 ppm and on the processed products corn, field, flour at 26 ppm, corn, field, grits at 10 ppm, **corn, field, meal at 28 ppm**, corn, field, oil at 3 ppm, rice, brown at 14 ppm, rice, polished rice at 18 ppm, rice, bran at 31 ppm, **rice, hulls at 35 ppm, wheat, bran at 40 ppm**, wheat, flour at 10 ppm, **wheat, germ at 98 ppm, wheat milled by products at 35 ppm, wheat, shorts at 38 ppm**, corn, field, refined oil at 3 ppm.”

# FACILITIES APPROVED TO USE SULFURYL FLUORIDE AS A FUMIGANT:

- On July 15, 2005, US EPA approved a 70 ppm residue tolerance for fluoride on ALL processed food. Fumigation is approved in:
  - Food and feed processing plants
  - Bakeries
  - Bottlers
  - Canneries
  - Dairies, creameries, milk processing plants
  - Feed mills, feed stores
  - Fresh fruit packing and processing
  - Meat processing
  - Poultry processing
  - Wineries, wine cellars
  - Flour mills, machinery, warehouses, bins, elevators

- **Egg processing**
- **Candy and confectionary plants**
- **Sugar processing, cane mills, etc.**
- **Cider mills**
- **Dry food products plants**
- **Tobacco processing**
- **Air treatment for processing and transportation of foods**
- **Beverage processing**
- **Nut processing**
- **Cereal processing**
- **Seafood processing**
- **Vegetable oil processing**
- **Spice mills**
- **Vinegar processing**
- **Farinaceous processing (noodles, etc.)**
- **Mushroom processing**
- **Dried fruit processing**
- **Pickle processing**
- **Ice plants**
- **Chocolate processing**
- **Fruit juice processing**

# WHAT IS FLUORIDE USED FOR AND WHERE IS IT FOUND IN?



**Osteoporosis  
Treatment**

## Arthritis & Rheumatism

Official Journal of the American College of Rheumatology  
Volume 39, No. 11, November 1996, pp 1791-1801

Recommendations for the Prevention and Treatment of  
Glucocorticoid-Induced Osteoporosis

American College of Rheumatology Task Force on Osteoporosis  
Guidelines

- **“Fluoride.**
- The authors suggested that controlled trials of the efficacy of sodium fluoride should be conducted in patients with glucocorticoid-induced osteoporosis.
- The Task Force agrees and further recommends that such trials utilize low-dose slow-release preparations of sodium fluoride.”

**[PATHOGENESIS, PREVENTION AND THERAPY OF STEROID OSTEOPOROSIS]**

DAMBACHER MA, OLAH AJ, MAURER H, GAMPP R, RUEGSEGG P.

Z ORTHOP IHRE GRENZGEB. 1990 MAY-JUN;128(3):234-9.

- “The pathogenesis of glucocorticoid osteoporosis is complex.
- **For the prevention and treatment of glucocorticoid-induced osteoporosis, frequently used drugs today are fluorides, ossein-hydroxy-apatite complexes and, especially in acute glucocorticoid osteoporosis, calcitonin.”**

# SODIUM FLUORIDE SHIPPING LABEL:



*First In Fluorides*

\_\_\_\_\_ LBS. NET

*What's the other 2%?*

**98% CRYSTAL**

# SODIUM FLUORIDE

*I feel better now*

NaF **98%** Min.  
SODIUM SULFATE  
SODIUM SILICOFLUORIDE  
SODIUM CHLORIDE

**UNCOLORED**  
NOT SOLD FOR INSECTICIDE  
OR ROENTGENIC USES.

*WOW not for rats !!*

**WARNING!**  
MAY BE FATAL IF INHALED  
OR SWALLOWED.  
Avoid breathing dust.  
Keep away from food and feed  
products.  
Wash thoroughly after handling.  
Sweep up spillage.

**STORE IN A DRY PLACE.**  
KEEP DRUM TIGHTLY CLOSED

**POISON**

**CALL A PHYSICIAN IMMEDIATELY!**  
**ANTIDOTE:** Give a tablespoonful of salt in a glass of water every 15 min. Continue until vomit fluid is clear. Proceed by one way or the other unless solution is available. Give strong tea or coffee as available until relief is obtained.  
Give plenty of rest or use of hospital facilities if necessary. Do not give any liquid if unconscious or if danger of choking.

**INSTRUCTIONS FOR WATER FLUORIDATION:**

**CAUTION:** Application of this product for water fluoridation is subject to approval of all interested state and local health authorities. Its use should conform to the American Water Works Association's "Standard of Recommended Fluoride and Arsenic."

Water dosage must not raise the total fluoride concentration in drinking water above 1.5 ppm, (i. e. Public Health Service maximum limit)

**Allied  
Chemical**

**GENERAL CHEMICAL DIVISION**

40 BOSTON STREET, NEW YORK 6, N. Y., U. S. A.

# HOW MUCH IS PRODUCED ANNUALLY?

- **Byproduct Calcium Fluoride is recovered from industrial waste streams.**
- **About 10 million tons of phosphoric acid, H<sub>3</sub>PO<sub>4</sub>, are produced in the United States each year. Most of the acid (about 80%) is used in the production of agricultural fertilizers, with the remainder being used for detergent additives (about 10%), cleaners, insecticide production, and cattle feed additives. The commercial method of preparation is the addition of sulfuric acid to phosphate rock.**
- **$3 \text{H}_2\text{SO}_4(l) + \text{Ca}_3(\text{PO}_4)_2(s) + 6 \text{H}_2\text{O}(l) \rightleftharpoons 2 \text{H}_3\text{PO}_4(s) + 3 \text{CaSO}_4 \cdot 2\text{H}_2\text{O}(s)$**
- **Byproduct Fluorosilicic acid is recovered from phosphoric acid plants processing phosphate rock.**
- **Byproduct Fluorosilicic acid: 65,200 tons in 2001**

CDC: Agency for Toxic Substances and Diseases Registry  
<http://www.atsdr.cdc.gov/lfacts11.html>

“Fluorosilicic acid is mainly produced as a byproduct of the manufacture of phosphate fertilizers where phosphate rock, containing fluorides and silicates, is treated with sulfuric acid.”

“The chemicals most commonly used by American waterworks for water fluoridation are **fluorosilicic acid**, sodium silicofluoride, and sodium fluoride.”

CDC: Agency for Toxic Substances and Diseases Registry  
<http://www.atsdr.cdc.gov/tfacts11.html>

“The major use of sodium hexafluorosilicate and **fluorosilicic acid is as fluoridation agents for drinking water**. They have been added to water since the mid-1940s to prevent tooth decay.”

Sodium Hexafluorosilicate and Fluorosilicic Acid: Review of Toxicological Literature Scott Masten, PHD National Institute of Environmental Health Science, October 2001

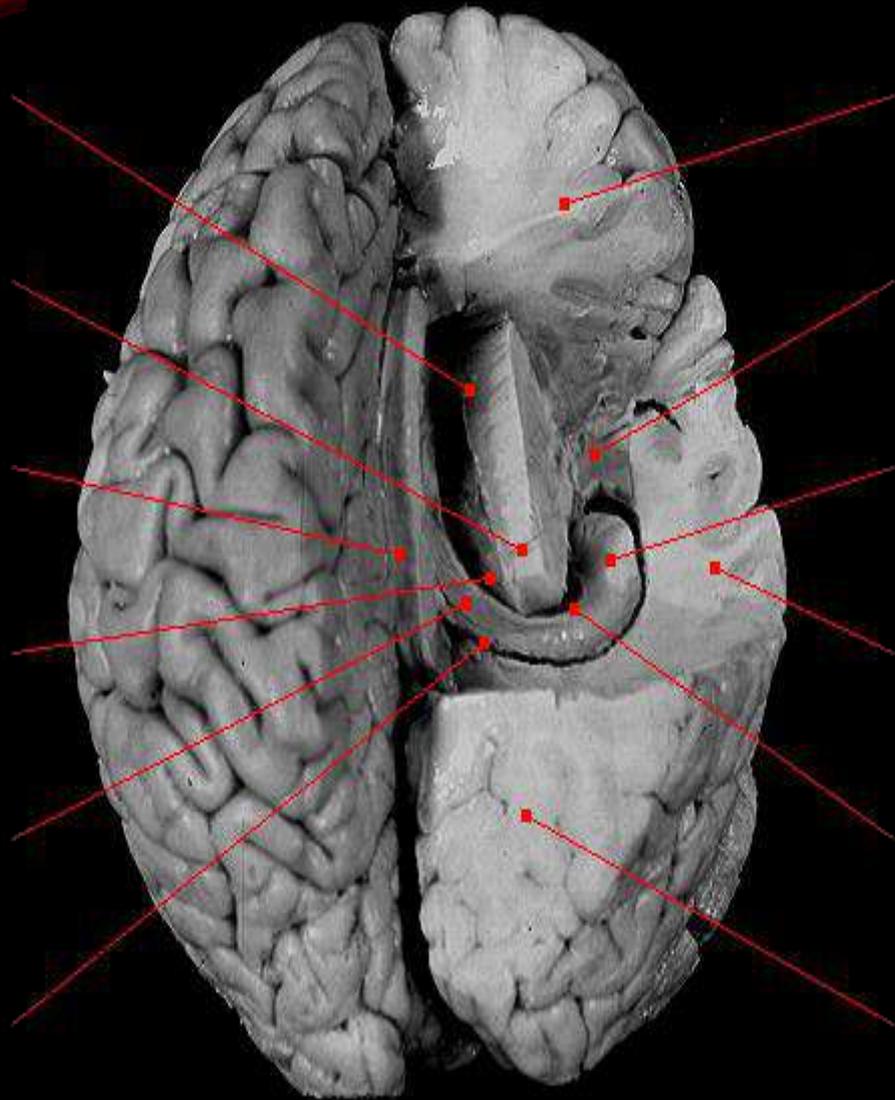
Let's read that statement one more time.

“Fluorosilicic acid is mainly produced as a byproduct of the manufacture of phosphate fertilizers where phosphate rock, containing fluorides and silicates, is treated with sulfuric acid.”

**SODIUM HEXAFLUROSILICATE AND FLUOROSILICIC ACID: REVIEW OF TOXICOLOGICAL LITERATURE** SCOTT MASTEN, PHD NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE, OCTOBER 2001

# HOW DOES FLUORIDE HARM ANIMALS?





# HISTOLOGICAL CHANGES IN THE BRAIN OF YOUNG FLUORIDE-INTOXICATED RATS

SHIVARAJASHANKARA YM, SHIVASHANKARA AR, BHAT PG, RAO SM, RAO SH  
SH FLUORIDE 35 (1): 12-21 FEB 2002

- “rats exposed to 100 ppm fluoride showed significant neurodegenerative changes in the hippocampus, amygdala, motor cortex, and cerebellum.
- **These histological changes suggest a toxic effect of high-fluoride intake during the early developing stages of life on the growth, differentiation, and subcellular organization of brain cells in rats.”**

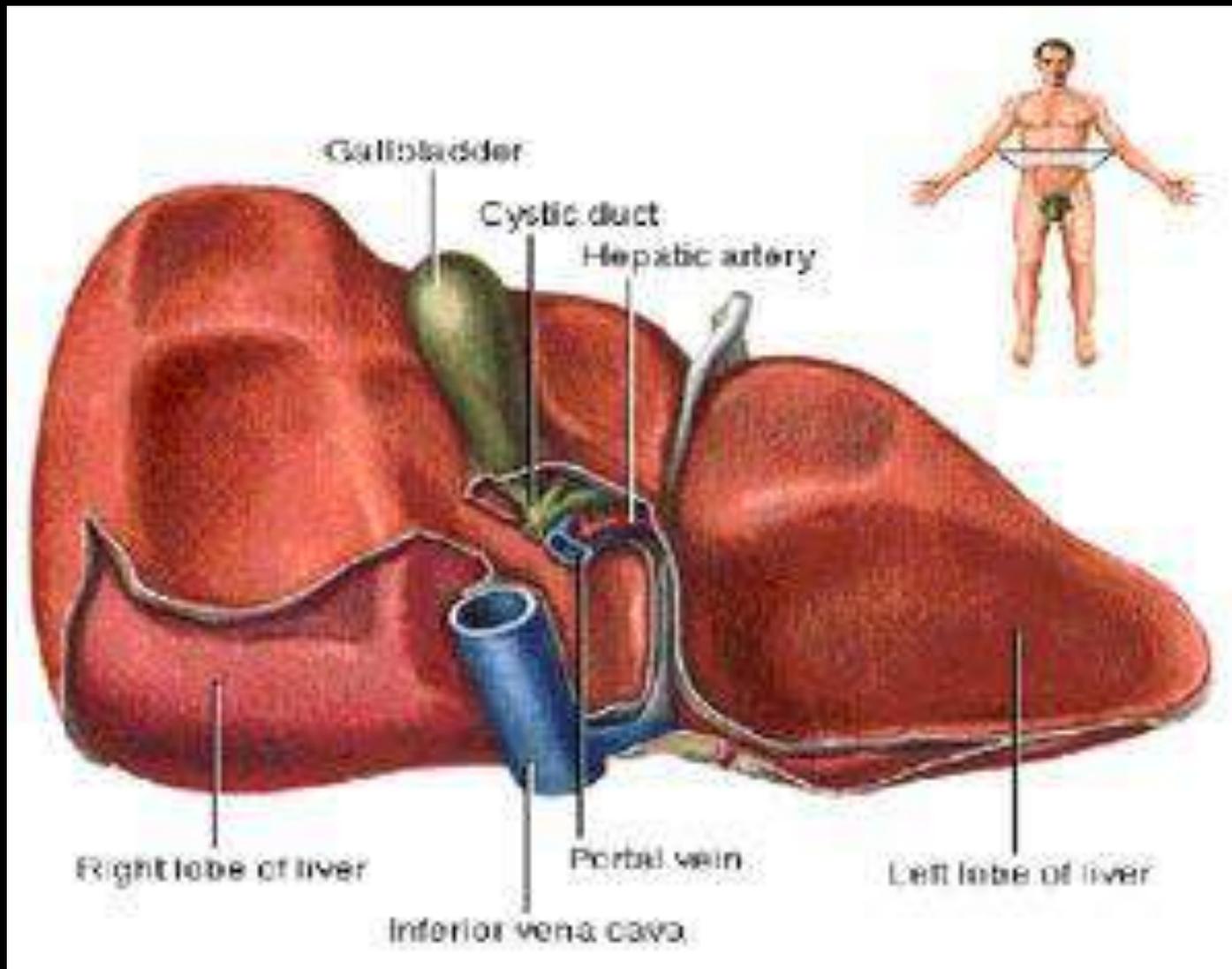
**INFLUENCE OF CHRONIC FLUOROSIS ON MEMBRANE LIPIDS IN RAT BRAIN. GUAN ZZ, WANG YN, XIAO KQ, DAI DY, CHEN YH, LIU JL, SINDELAR P, DALLNER G. NEUROTOXICOL TERATOL. 1998 SEP-OCT;20(5):537-42.**

- “Brain membrane lipid in rats were analyzed after being fed either 30 or 100 ppm fluoride for 3, 5, and 7 months...
- **After 7 months of fluoride treatment, the total brain phospholipid content decreased by 10% and 20% in the 30 and 100 ppm fluoride groups, respectively...**
- **The results demonstrate that the contents of phospholipid and ubiquinone are modified in brains affected by chronic fluorosis and these changes of membrane lipids could be involved in the pathogenesis of this disease.”**

**EFFECTS OF SODIUM FLUORIDE ON LOCOMOTOR BEHAVIOR AND A FEW  
BIOCHEMICAL PARAMETERS IN RATS** PAUL V, EKAMBARAM P, JAYAKUMAR  
AR ENVIRONMENTAL TOXICOLOGY AND PHARMACOLOGY 6 (3): 187-191  
NOV 1998

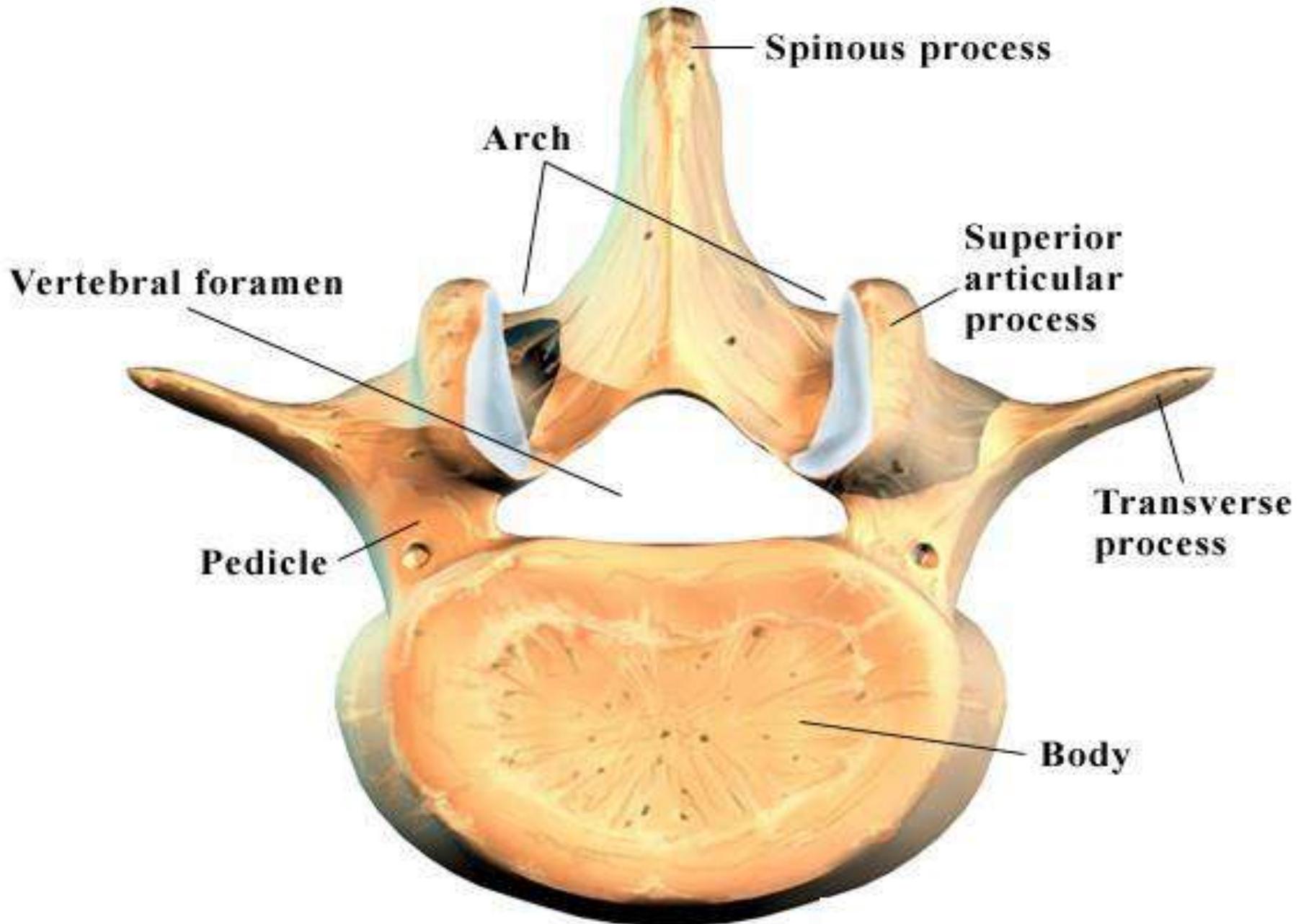
**“A suppression of spontaneous motor activity suggests that fluoride has, by a central action, inhibited motivation of these animals to exhibit locomotor behavior.**

# LIVER



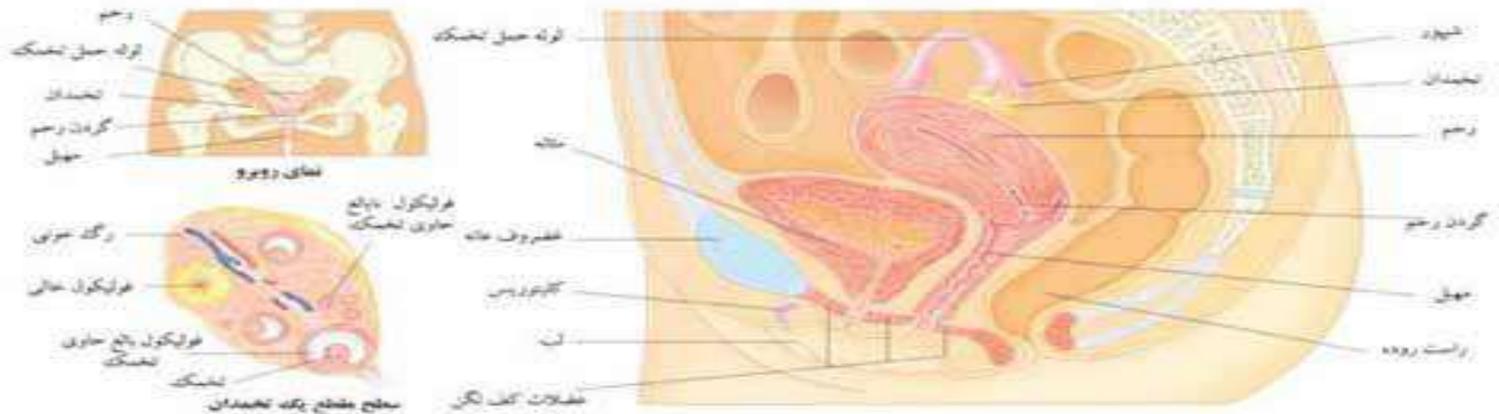
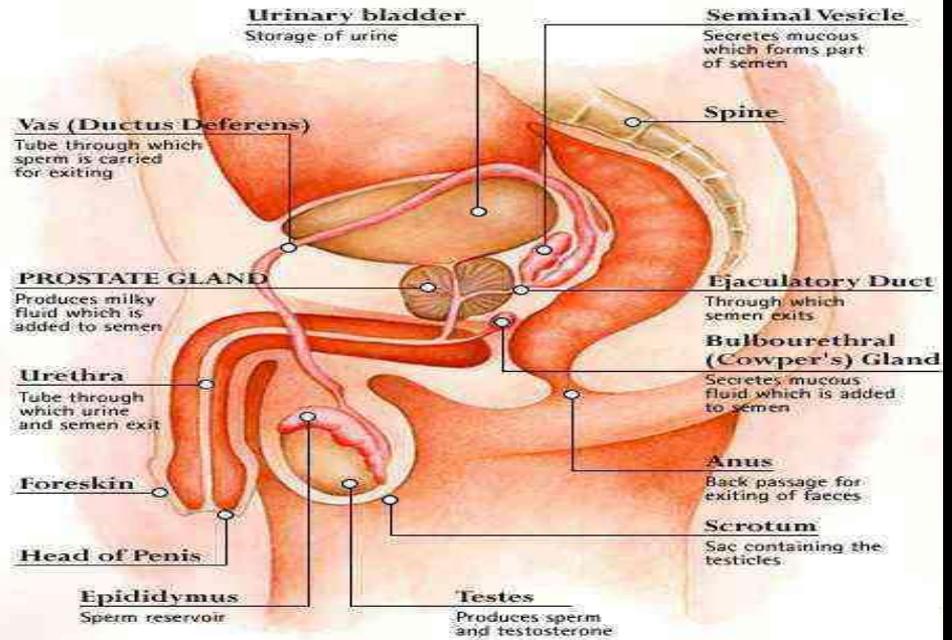
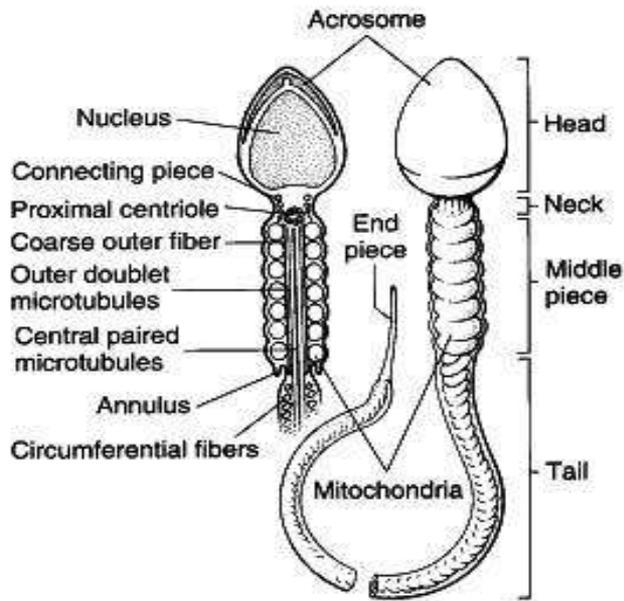
- “Wistar rats were supplied with drinking water containing either 30 or 100 ppm fluoride (NaF) for seven months...
- **Total ubiquinone contents in rat liver were reduced by 11% in the group treated with 30 ppm fluoride and by 42% in the group treated with 100 ppm fluoride.** In the subclasses of ubiquinone, both ubiquinone-9 and ubiquinone-10 amounts decreased after fluoride treatment.
- **These modifications of membrane lipids might be induced by oxidative stress, which might be an important factor in the pathogenesis of chronic fluorosis.”**

# Lumbar Vertebra, top view



**CLASTOGENIC ACTIVITY OF SODIUM FLUORIDE TO RAT VERTEBRAL BODY-DERIVED CELLS IN CULTURE. MIHASHI M, TSUTSUI T MUTAT RES. 1996 MAY;368(1):7-13.**

- “The US National Toxicology Program has shown equivocal evidence of carcinogenic activity of sodium fluoride (NaF) in male F344/N rats based on the occurrence of five osteosarcomas in treated animals.
- In the study the osteosarcomas developed mainly in the rat vertebrae... Significant increases in the frequencies of chromosome aberrations were induced in a dose- and treatment time-dependent fashion when NaF was administered to RVBd cells at 0.5 and 1.0 mM for 24 and 48 h.
- **The results indicate that NaF is genotoxic to rat vertebrae, providing a possible mechanism for the vertebrae, as a target organ of NaF carcinogenesis.”**



## REPRODUCTIVE SYSTEM

**HISTOPATHOLOGICAL CHANGES IN RABBIT OVARY DURING  
EXPERIMENTAL FLUOROSIS. SHASHI. INDIAN J PATHOL MICROBIOL.  
1990 APR;33(2):113-7.**

- “Albino rabbits were injected sodium fluoride solutions in the concentration of 5, 10, 20 and 50 mg/kg body weight/day subcutaneously for 100 days...
- **The data indicate that the structural alterations in the ovary were more pronounced with the concomitant increase in the dose of fluoride.”**

**A STUDY OF THE EFFECT OF HIGH CONCENTRATIONS OF FLUORIDE ON THE REPRODUCTIVE ORGANS OF MALE RABBITS, USING LIGHT AND SCANNING ELECTRON MICROSCOPY. SUSHEELA AK, KUMAR A J REPROD FERTIL. 1991 JUL;92(2):353-60.**

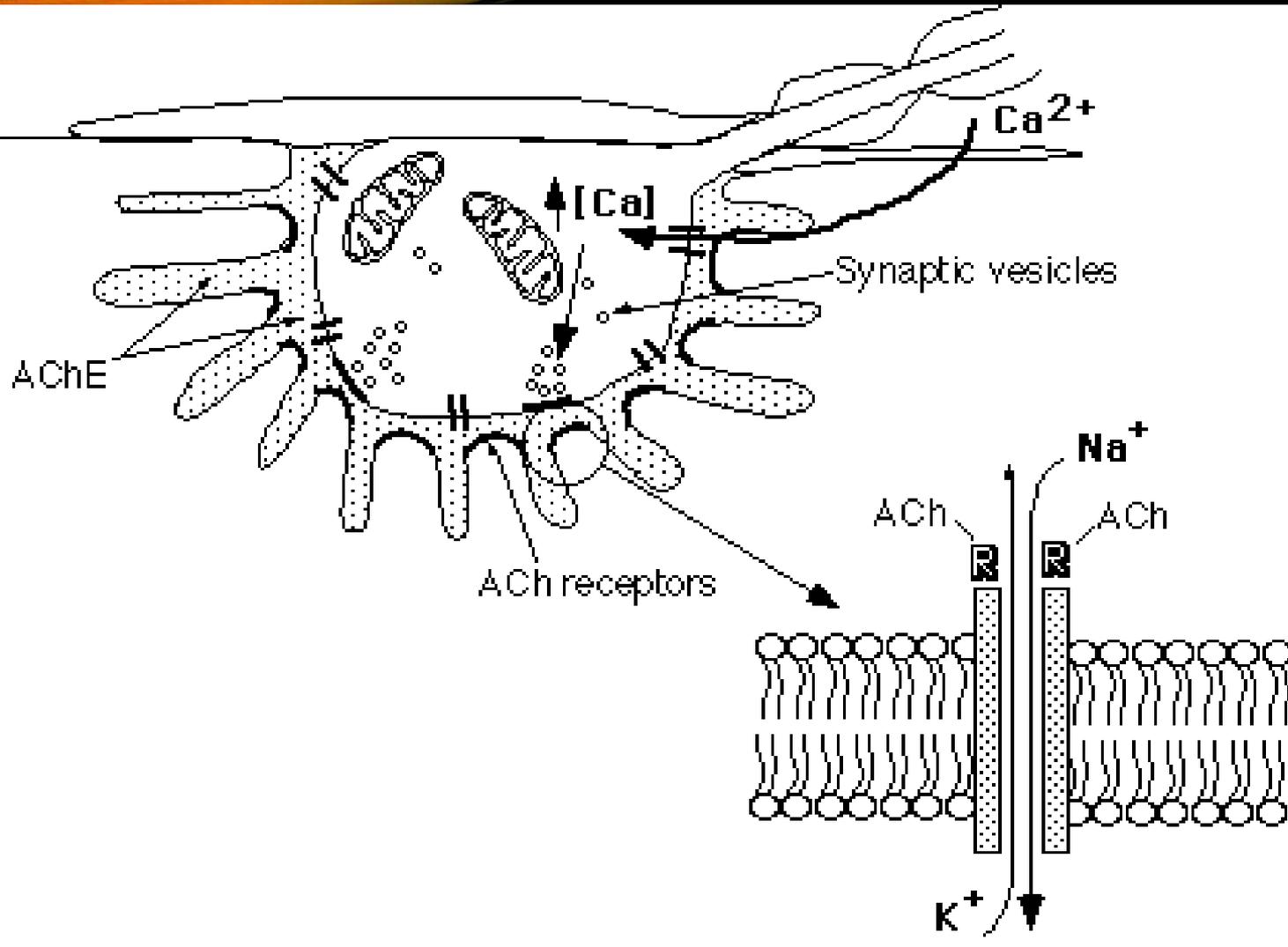
- “Spermatogenesis ceased only in animals treated for 29 months.
- **The difference in the structural changes observed in the testes of the 2 treated groups may have been due to the blood-testis barrier.**
- **It is concluded that ingestion of high concentrations of fluoride has harmful effects on the male reproductive system.”**

- “The percentage of spermatozoa in ram semen with intact acrosomes and the level of spermatozoa motility decreased significantly after dilution and after 5 hr incubation at 38degreesC.
- **These changes undoubtedly affect the physiological functions of the sperm.”**

- **“A single microdose (50 micrograms/50 microl) injection of sodium fluoride (NaF) into the vasa deferentia of adult male albino rats (*Rattus norvegicus*) caused arrest of spermatogenesis and absence of spermatozoa in the lumina of the seminiferous tubules of the testes, which consequently led to a decline in the sperm count in the caudae epididymides.**
- Scanning electron microscopy of cauda and vas deferens sperm revealed deflagellation and tail abnormalities.
- **Thus microdoses of sodium fluoride were found to affect reproductive function and fertility rate.”**

ULTRASTRUCTURAL STUDIES OF SPERMIOGENESIS IN RABBIT EXPOSED TO CHRONIC FLUORIDE TOXICITY. KUMAR A, SUSHEELA AK. INT J FERTIL MENOPAUSAL STUD. 1994 MAY-JUN;39(3):164-71.

- **“A wide variety of structural defects were observed in the flagellum, the acrosome, and the nucleus of the spermatids and epididymal spermatozoa of fluoride-treated rabbits.**
- Abnormalities included absence of outer microtubules, complete absence of axonemes, structural and numeric aberrations of outer dense fibers, breakdown of the fibrous sheath, and structural defects in the mitochondria of the middle piece of the flagellum. Detachment and peeling off of the acrosome from the flat surfaces of the nucleus were also observed.
- **The abnormalities observed render the sperm nonfunctional and ineffective, and thus there is a possible role of fluoride in causing infertility.”**



nicotinic acetylcholine receptors

DECREASED NICOTINIC RECEPTORS IN PC12 CELLS AND RAT BRAINS INFLUENCED BY FLUORIDE TOXICITY--A MECHANISM RELATING TO A DAMAGE AT THE LEVEL IN POST-TRANSCRIPTION OF THE RECEPTOR GENES. SHAN KR, QI XL, LONG YG, NORDBERG A, GUAN ZZ. TOXICOLOGY. 2004 AUG 5;200(2-3):169-77.

- “In order to reveal mechanisms of the decreased nicotinic acetylcholine receptors (nAChRs) resulted from fluoride toxicity, we treated PC12 cells by different concentrations of fluoride (0.1-100 ppm) for 48 h, and exposed rats to high doses of fluoride (30 and 100 ppm) in their drinking water for 7 months...
- **The results suggest that the deficit of nAChRs induced by fluoride toxicity occurs at the level of post-transcription of the receptor gene, in which a mechanism might be involved in the damage by oxidative stress.”**

**CHRONIC FLUORIDE TOXICITY DECREASES THE NUMBER OF NICOTINIC ACETYLCHOLINE RECEPTORS IN RAT BRAIN** YI-GUO LONGA, YA-NAN WANG, JIA CHEN, SU-FEN JIANG, AGNETA NORDBERG AND ZHI-ZHONG GUAN  
**NEUROTOXICOLOGY AND TERATOLOGY** VOLUME 24, ISSUE 6 , NOVEMBER-DECEMBER 2002, PAGES 751-757

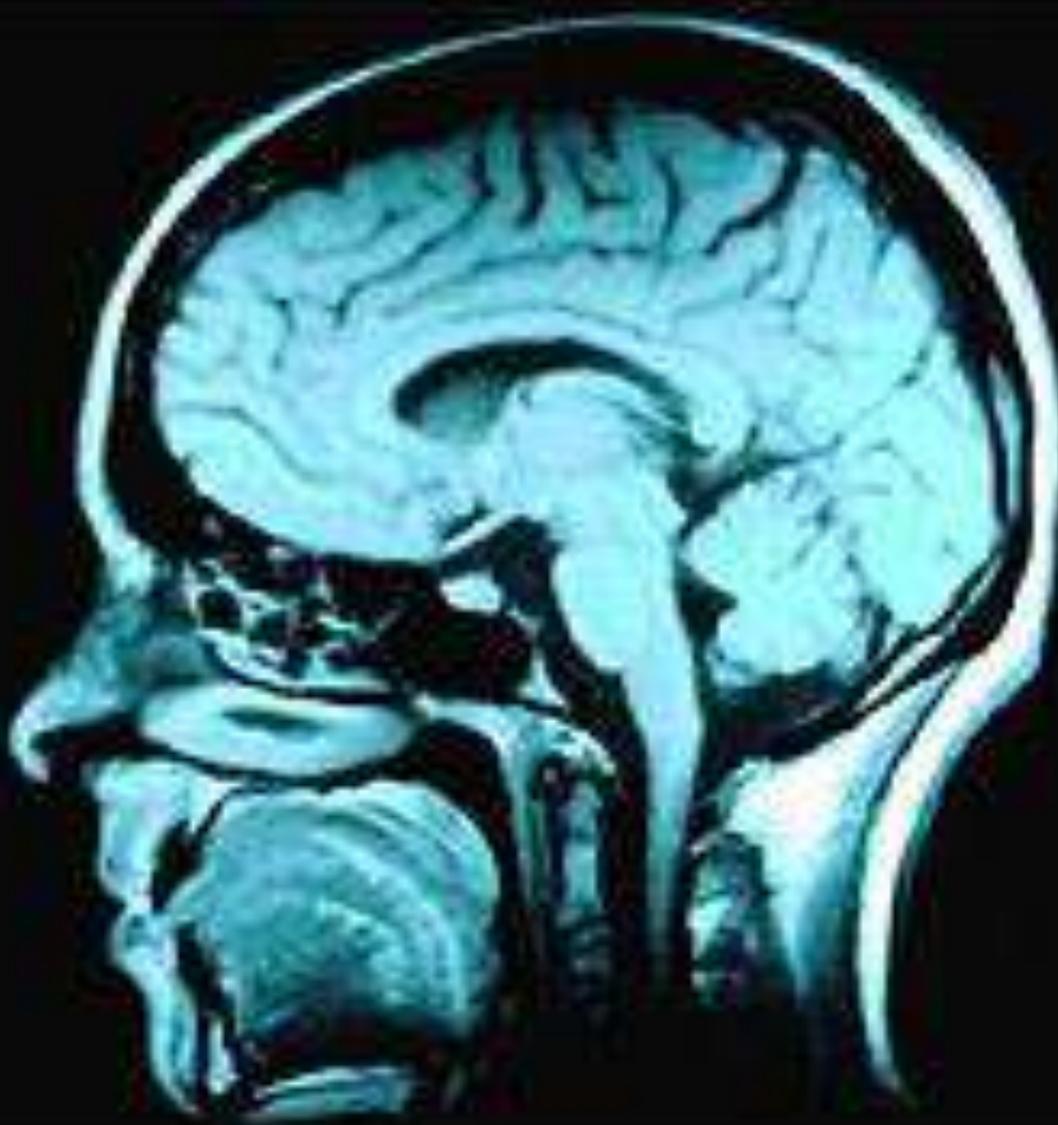
- **Since nAChRs play major roles in cognitive processes such as learning and memory, the decrease in the number of nAChRs caused by fluoride toxicity may be an important factor in the mechanism of brain dysfunction in the disorder.”**

[STUDIES ON DNA DAMAGE AND APOPTOSIS IN RAT BRAIN INDUCED BY FLUORIDE] CHEN J, CHEN X, YANG K, XIA T, XIE H. ZHONGHUA YU FANG YI XUE ZA ZHI. 2002 JUL;36(4):222-4. PMID: 12411198

- “The DNA damage in pallium neurons in rats of the fluoride group was much more serious compared with those of the control group,
- CONCLUSION: **Sodium fluoride could induce DNA damage and apoptosis in rats brain.”**



# FLUORIDE AND HUMANS



**INTELLIGENCE**

## EFFECT OF FLUORIDE EXPOSURE ON INTELLIGENCE IN CHILDREN

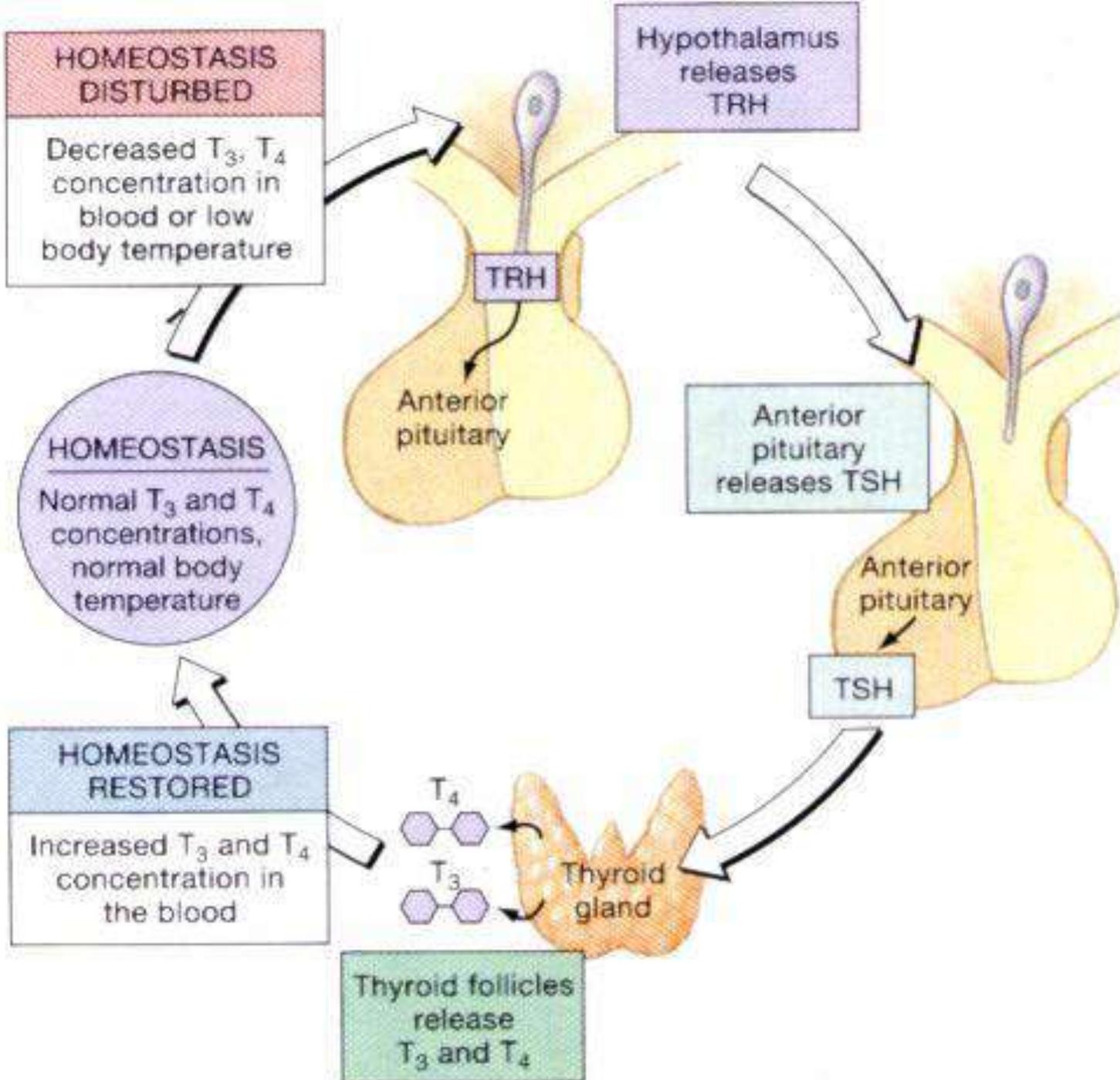
LI XS, ZHI JL, GAO RO FLUORIDE 28 (4): 189-192 NOV 1995

- “The intelligence was measured of 907 children aged 8-13 years living in areas which differed in the amount of fluoride present in the environment.
- The Intelligence Quotient (IQ) of children living in areas with a medium or severe prevalence of fluorosis was lower than that of children living in areas with only slight fluorosis or no fluorosis.
- **A high fluoride intake was associated with a lower intelligence.**
- **The effect of exposure to a high level of fluoride on intelligence may occur at an early stage of development of the embryo and infant when the differentiation of brain nerve cells is occurring and development is most rapid.”**

**EFFECT OF FLUORIDE IN DRINKING WATER ON CHILDREN'S INTELLIGENCE**  
XIANG Q, LIANG Y, CHEN L, WANG C, CHEN B, CHEN X, ZHOU M FLUORIDE  
36 (2): 84-94 MAY 2003

- “The Intelligence Quotient (IQ) was measured in 512 children, aged 8-13 years, living in two villages in Sihong County, Jiangsu Province, China, differing in the level of **fluoride** in their drinking water...
- The children's IQs were not related to urinary iodine, family income, or parent's education level. **Higher drinking water fluoride levels were significantly associated with higher rates of mental retardation (IQ <70) and borderline intelligence (IQ 70-79).**
- The Benchmark Concentration (BMC) for the concentration-response relationship between IQ <80 and the drinking water **fluoride** level was 2.32 mg/L, and the lower-bound confidence limit (BMCL) of the BMC was 1.85 mg/L. **In endemic fluorosis areas, drinking water fluoride levels greater than 1.0 mg/L may adversely affect the development of children's intelligence.”**

# THYROID



**EXCESS FLUORIDE INGESTION AND THYROID HORMONE DERANGEMENTS IN CHILDREN LIVING IN DELHI, INDIA** SUSHEELA AK, BHATNAGAR M, VIG K, MONDAL NK **FLUORIDE 38 (2): 98-108 MAY 2005**

- These findings indicate that children with or even without dental fluorosis from exposure to excess **fluoride**, either through drinking water or through other sources, may have thyroid hormone derangements that may not be clinically overt until late stages.
- Determining free T-3, free T-4, and TSH is therefore important for a proper diagnosis of potential health problems.
- Withdrawal from **fluoride** sources along with measures to correct the thyroid hormonal status may be necessary to promote better health in such children living in **fluoride** endemic areas."

# WATER FLUORIDATION...

## CAUSES DENTAL FLUOROSIS

"Fluorosis is poisoning by fluorides"

— *Websters Encyclopedic Unabridged Dictionary*



Very Mild  
1ppm

Brigham City, Utah

---



1mg per day  
Prescription Fluoride

White and Brown Enamel

---



Severe  
Water 4mg/day

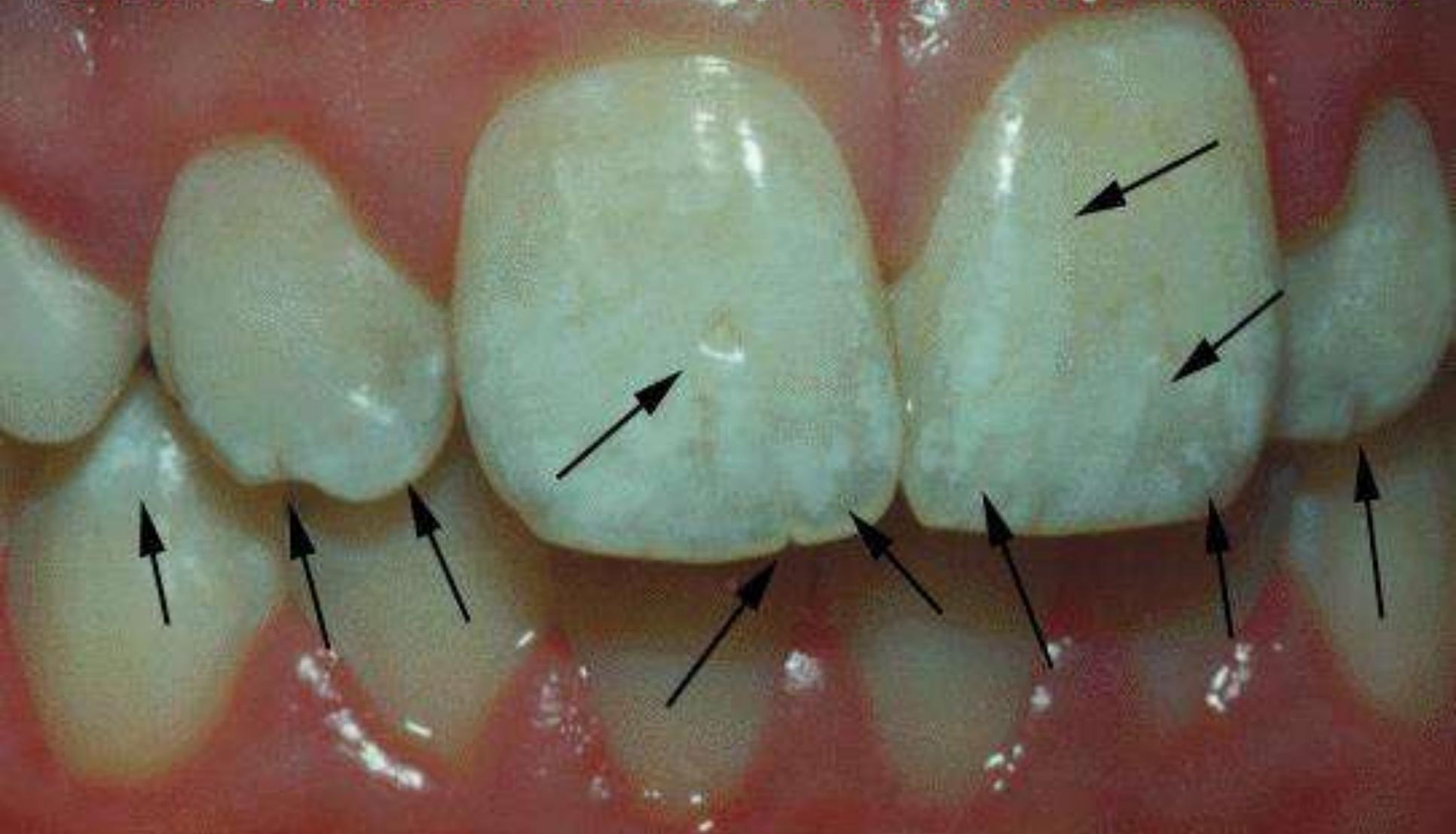
Brown Pitted Enamel

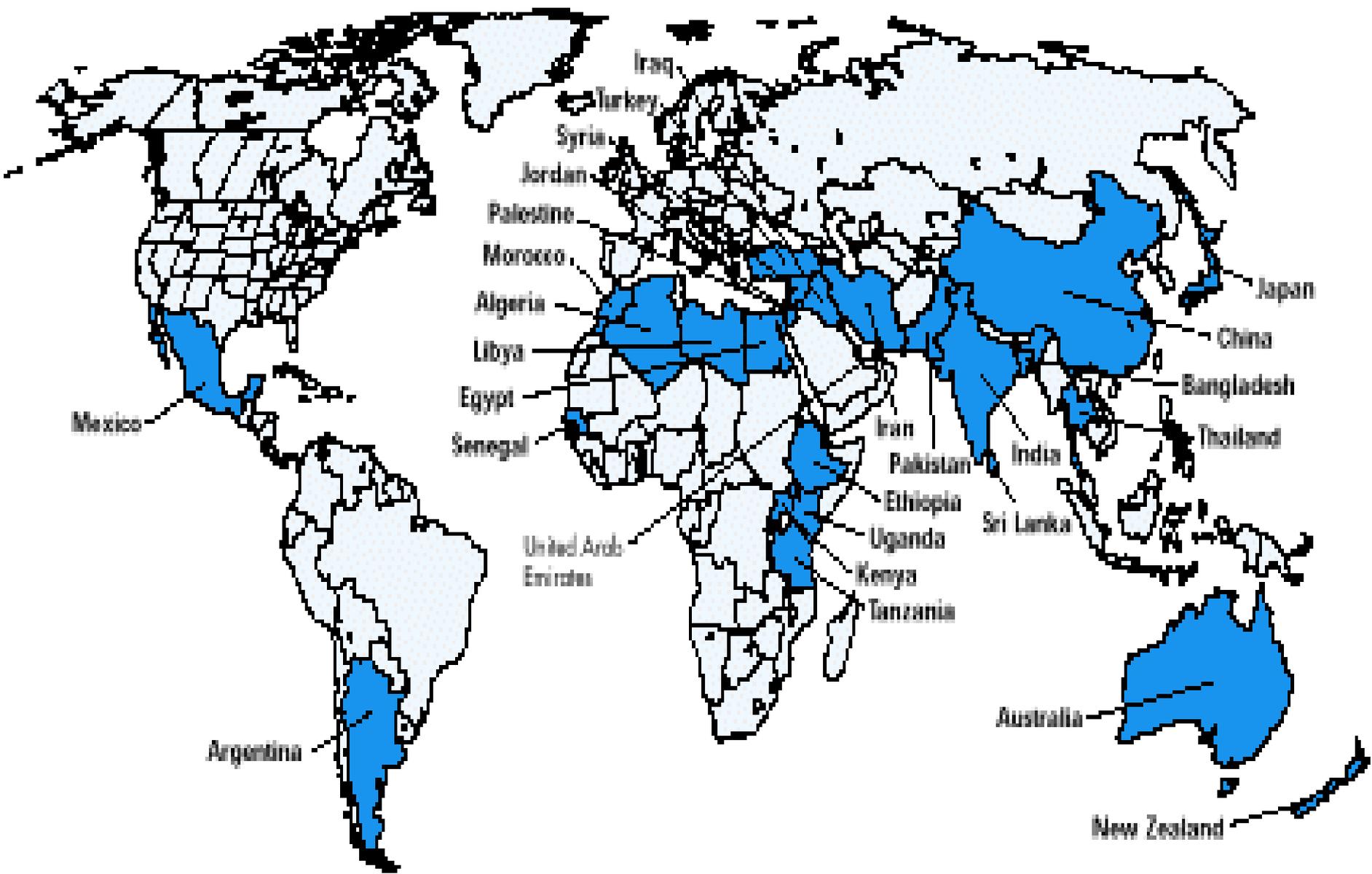


Do you have dental  
fluorosis?

## ***Moderate effects of Fluoridated water***

***Arrows point to discolored, cracked or pitted areas***





*Countries with endemic fluorosis due to excess fluoride in drinking water*

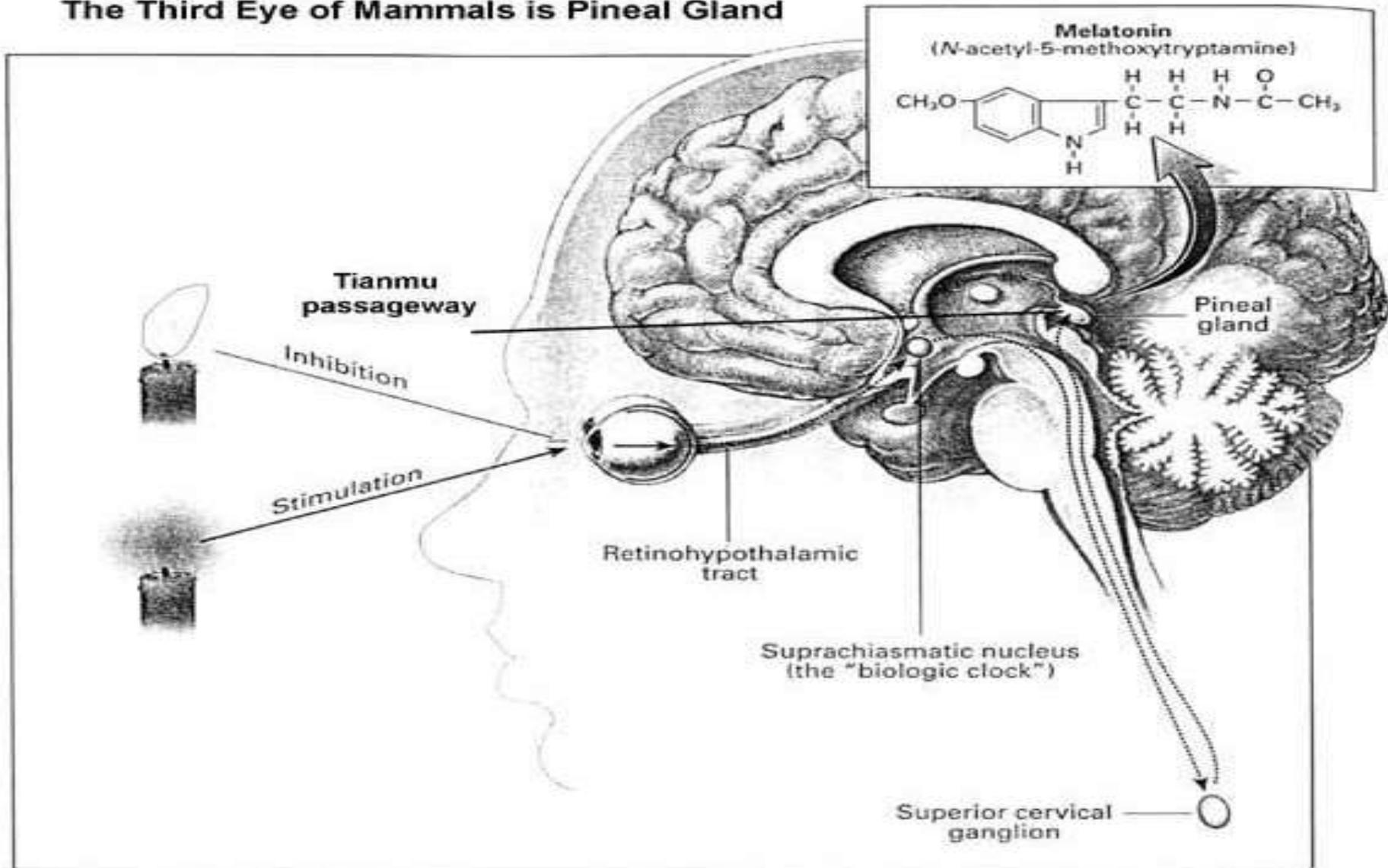
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**DENTAL FLUOROSIS AND CARIES EXPERIENCE IN RELATION TO THREE DIFFERENT DRINKING WATER FLUORIDE LEVELS IN SOUTH AFRICA. GROBLER SR, LOUW AJ, VAN KOTZE TJ. INT J PAEDIATR DENT. 2001 SEP;11(5):372-9.**

- “A strong positive correlation ( $P < 0.05$ ) was found between the caries experience and the fluorosis scores of children in the high fluoride area (Leeu Gamka) but no correlation could be found in the other two areas.
- Significantly ( $P < 0.01$ ) more children had decayed teeth in the high F area (Leeu Gamka) than in the other two areas.
- **CONCLUSION: The results suggest a positive association between high F levels in the drinking water and dental caries.**
- **Furthermore, a low caries experience and no difference in DMFT and fluorosis between the two low fluoride areas were found.”**

- **“Those who brushed their teeth before the age of 25 months had 11 times the odds of fluorosis compared with those beginning toothbrushing later; prolonged use of infant formula (greater than or equal to 13 months) was associated with 3.5 times the risk of fluorosis, compared with no, or shorter duration of, formula use.**
- We estimate that these factors were responsible for 72% and 22%, respectively, of the cases in our population.

## The Third Eye of Mammals is Pineal Gland



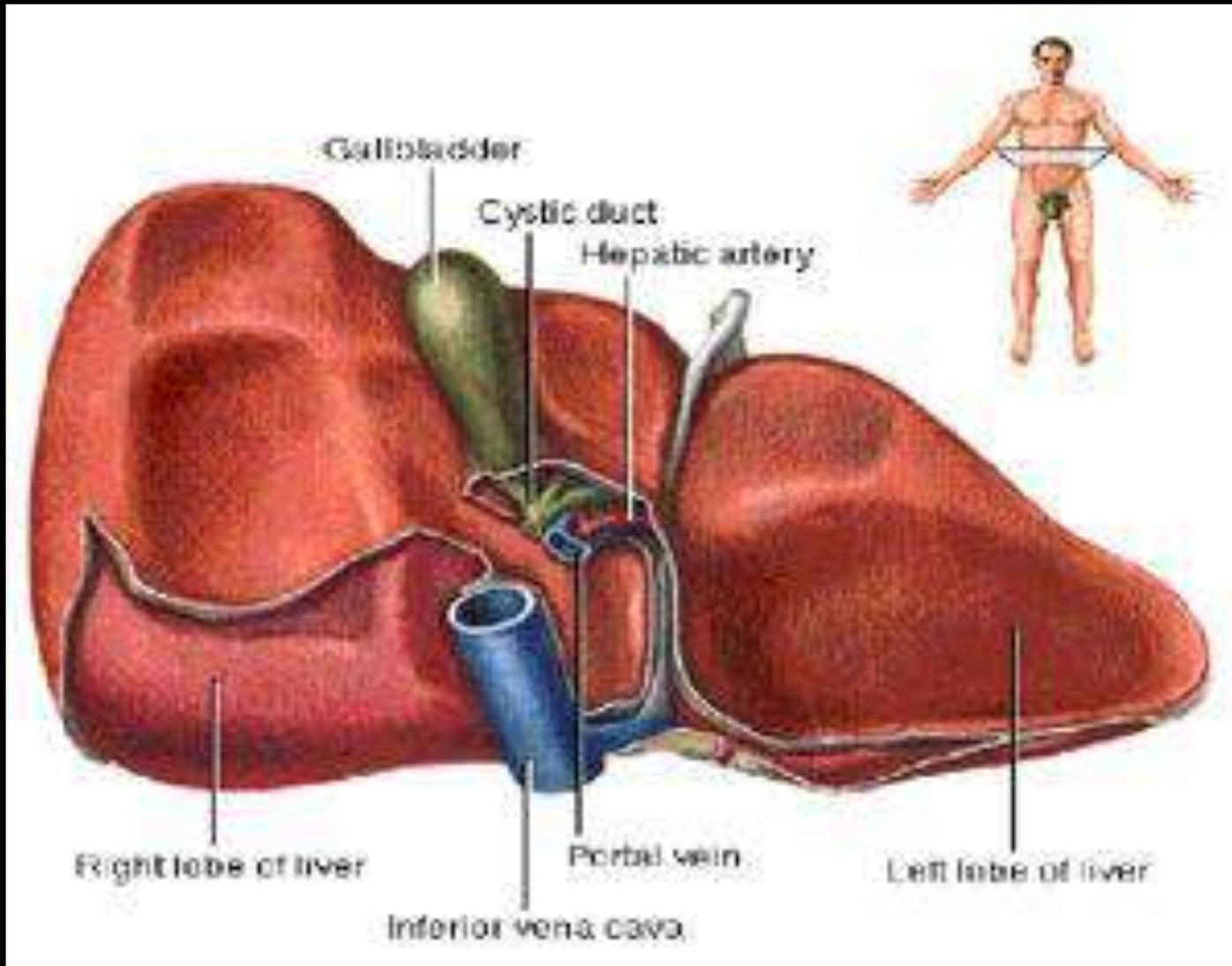
**Figure 1. Physiology of Melatonin Secretion.**

Melatonin (inset) is produced in the pineal gland. The production and secretion of melatonin are mediated largely by postganglionic retinal nerve fibers that pass through the retinohypothalamic tract to the suprachiasmatic nucleus, then to the superior cervical ganglion, and finally to the pineal gland. This neuronal system is activated by darkness and suppressed by light. The activation of  $\alpha_1$ - and  $\beta_1$ -adrenergic receptors in the pineal gland raises cyclic AMP and calcium concentrations and activates arylalkylamine *N*-acetyltransferase, initiating the synthesis and release of melatonin. The daily rhythm of melatonin secretion is also controlled by an endogenous, free-running pacemaker located in the suprachiasmatic nucleus.

FLUORIDE DEPOSITION IN THE AGED HUMAN PINEAL GLAND  
LUKE J CARIES RESEARCH 35 (2): 125-128 MAR-APR 2001

- “There was a positive correlation between pineal F and pineal Ca ( $r = 0.73$ ,  $p < 0.02$ ) but no correlation between pineal F and bone F.
- By old age, the pineal gland has readily accumulated F and its F/Ca ratio is higher than bone.”

# LIVER



- “Similarly, higher activities of serum transaminases (SGOT and SGPT) might be due to altered liver function, since both of these enzymes are known markers (of liver function).
- Thus, the above data reveal altered liver and Kidney function in fluorosis-afflicted individuals with high urine and serum fluoride but low sialic acid levels compared to normal controls.”



# **SKELETAL SYSTEM**

AGE-SPECIFIC FLUORIDE EXPOSURE IN DRINKING WATER AND  
OSTEOSARCOMA (UNITED STATES)  
CANCER CAUSES CONTROL. 2006 MAY;17(4):421-8.

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Received: 24 July 2005 Accepted: 07 November 2005

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AGE-SPECIFIC FLUORIDE EXPOSURE IN DRINKING WATER AND  
OSTEOSARCOMA (UNITED STATES)  
CANCER CAUSES CONTROL. 2006 MAY;17(4):421-8.

**OBJECTIVE:** We explored age-specific and gender-specific effects of fluoride level in drinking water and the incidence of osteosarcoma. **METHODS:** We used data from a matched case-control study conducted through 11 hospitals in the United States that included a complete residential history for each patient and type of drinking water (public, private well, bottled) used at each address. Our analysis was limited to cases less than 20 years old. We standardized fluoride exposure estimates based on CDC-recommended target levels that take climate into account. We categorized exposure into three groups (<30%, 30-99%, >99% of target) and used conditional logistic regression to estimate odds ratios.

AGE-SPECIFIC FLUORIDE EXPOSURE IN DRINKING WATER AND  
OSTEOSARCOMA (UNITED STATES)  
CANCER CAUSES CONTROL. 2006 MAY;17(4):421-8.

RESULTS: Analysis is based on 103 cases under the age of 20 and 215 matched controls. For males, the unadjusted odds ratios for higher exposures were greater than 1.0 at each exposure age, reaching a peak of 4.07 (95% CI 1.43, 11.56) at age 7 years for the highest exposure. Adjusting for potential confounders produced similar results with an adjusted odds ratio for males of 5.46 (95% CI 1.50, 19.90) at age 7 years. This association was not apparent among females.

CONCLUSIONS: Our exploratory analysis found an association between fluoride exposure in drinking water during childhood and the incidence of osteosarcoma among males but not consistently among females. Further research is required to confirm or refute this observation.

SERUM FLUORIDE AND SIALIC ACID LEVELS IN  
OSTEOSARCOMA. BIOL TRACE ELEM RES. 2009 APR 24. SANDHU R,  
LAL H, KUNDU ZS, KHARB S.

The mean value of fluoride in patients with other bone-forming tumors was approximately 50% of the group of osteosarcoma; however, it was significantly higher when compared with patients of group I. Serum sialic acid concentration was found to be significantly raised in patients with osteosarcoma as well as in the group with other bone-forming tumors as compared to the group of controls. There was, however, no significant difference in the group of patients of osteosarcoma when compared with group of patients with other bone-forming tumors. **These results showing higher level of fluoride with osteosarcoma compared to others suggesting a role of fluoride in the disease.**

**NEW EVIDENCE ON FLUORIDATION.**

DIESENDORF M, COLQUHOUN J, SPITTLE BJ, EVERINGHAM DN, CLUTTERBUCK  
FW.

AUST N Z J PUBLIC HEALTH. 1997 APR;21(2):187-90.

“A review of recent scientific literature reveals a consistent pattern of evidence--hip fractures, skeletal fluorosis, the effect of fluoride on bone structure, fluoride levels in bones and osteosarcomas--**pointing to the existence of causal mechanisms by which fluoride damages bones.**

**BONE FRAGILITY OF THE PERIPHERAL SKELETON DURING FLUORIDE THERAPY FOR OSTEOPOROSIS** SCHNITZLER CM, WING JR, GEAR KA, ROBSON HJ CLIN ORTHOP RELAT RES. 1990 DEC;(261):268-75.

- **There were 26 periarticular, six femoral neck, three pubic rami, three tibia and fibula, one greater trochanter, and two subtrochanteric fractures.**
- Vertebral fractures appeared first, then periarticular, then femoral neck, and lastly long-bone shaft fractures.
- **All fractures were spontaneous in onset.**
- The peripheral fracture rate during treatment was three times that in untreated osteoporosis. Roentgenograms must be repeated at intervals of three to four weeks before the pathognomonic callus becomes visible, and the diagnosis can be made.
- **Trabecular stress fractures tend to occur in the first 18 months of treatment, and cortical stress fractures occur after 30 months of therapy."**

**RISK FACTORS FOR THE DEVELOPMENT OF STRESS FRACTURES DURING FLUORIDE THERAPY FOR OSTEOPOROSIS.** SCHNITZLER CM, WING JR, MESQUITA JM, GEAR AK, ROBSON HJ, SMYTH AE. **J BONE MINER RES.** 1990 MAR; 5 SUPPL 1:S195-200.

“We conclude that stress fracture patients had more severe trabecular and cortical OP and possibly a poorer bone-forming capacity before therapy than patients without stress fractures. **We suspect that fluoride therapy may temporarily further weaken bone and so lead to stress fractures in severely osteoporotic patients.**”

**STRESS FRACTURES OF THE LOWER LIMBS IN OSTEOPOROTIC PATIENTS TREATED WITH FLUORIDE.** ORCEL P, DE VERNEJOU MC, PRIER A, MIRAVET L, KUNTZ D, KAPLAN G. **J BONE MINER RES.** 1990 MAR;5 SUPPL 1:S191-4.

- “We report clinical and bone morphometric findings in 18 osteoporotic patients who experienced stress fractures during fluoride therapy.
- The clinical course was favorable in all patients who stopped fluoride, although 5 patients who continued the treatment had either completion of femoral neck stress fractures to hip fractures (n = 2), or recurrent stress fractures (n = 2), or both (n = 1).
- Fluoride appears to be a key factor in the pathogenesis of stress fractures, and may be associated with increased trabecular resorption in some treated patients.”

**BILATERAL FRACTURES OF FEMORAL NECK IN PATIENTS WITH MODERATE RENAL FAILURE RECEIVING FLUORIDE FOR SPINAL OSTEOPOROSIS. GERSTER JC, CHARHON SA, JAEGER P, BOIVIN G, BRIANCON D, ROSTAN A, BAUD CA, MEUNIER PJ. BR MED J (CLIN RES ED). 1983 SEP 10;287(6394):723-5.**

- “Two patients with moderate renal failure sustained spontaneous bilateral hip fractures during treatment with fluoride, calcium, and vitamin D for osteoporosis.
- They had been taking sodium fluoride (40-60 mg/day) for 11 and 21 months, respectively.
- **As bilateral femoral neck fractures are very rare these data suggest a causal link between fractures and fluoride in patients with renal failure.**
- Thus fluoride should be given at a lower dosage, if at all, to patients with even mild renal failure.”

**EFFECT OF FLUORIDE TREATMENT ON THE FRACTURE RATE IN POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS.** RIGGS BL, HODGSON SF, O'FALLON WM, CHAO EY, WAHNER HW, MUHS JM, CEDEL SL, MELTON LJ 3RD. **N ENGL J MED.** 1990 MAR 22;322(12):802-9.

- “Fifty-four women in the fluoride group and 24 in the placebo group had side effects sufficiently severe to warrant dose reduction;
- the major side effects were gastrointestinal symptoms and lower-extremity pain.
- **We conclude that fluoride therapy increases cancellous but decreases cortical bone mineral density and increases skeletal fragility.**
- Thus, under the conditions of this study, the fluoride-calcium regimen was not effective treatment for postmenopausal osteoporosis.”



# **ELEVATED BLOOD LEAD**

ASSOCIATION OF SILICOFLUORIDE TREATED WATER WITH ELEVATED BLOOD  
LEAD

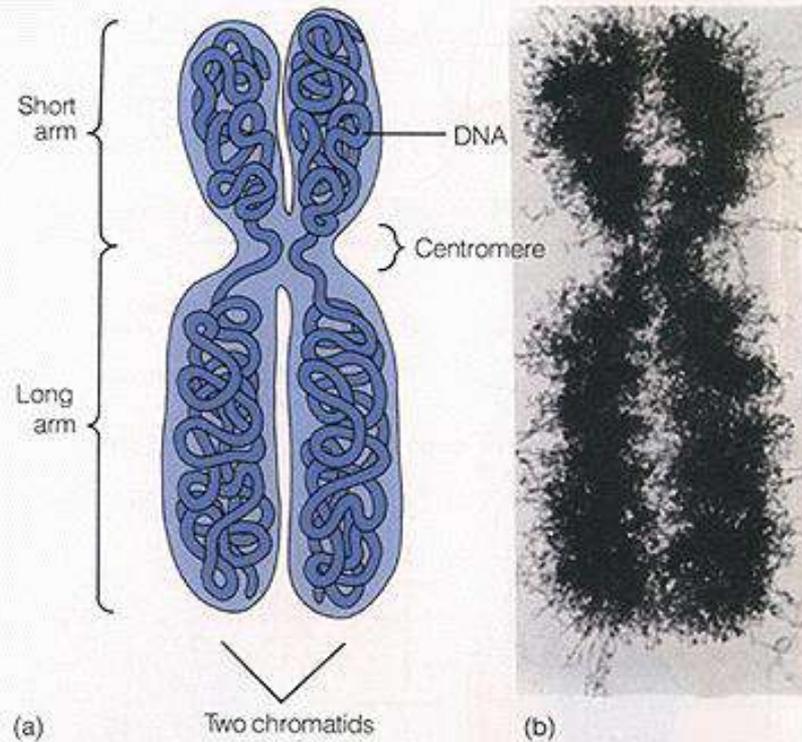
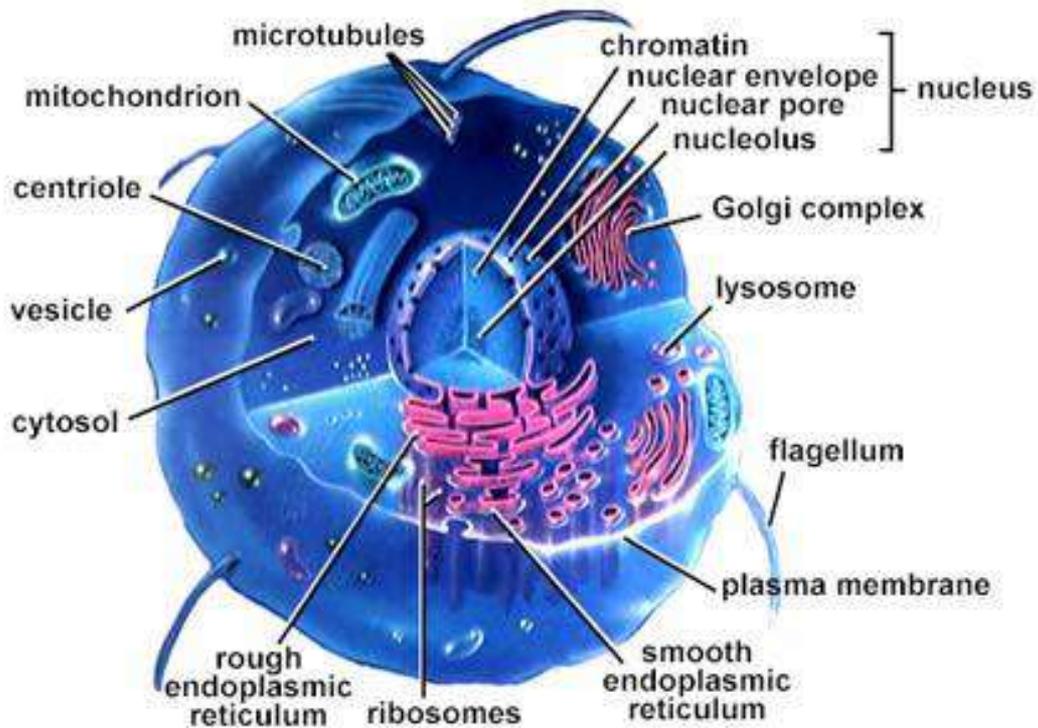
MASTERS RD, COPLAN MJ, HONE BT, DYKES JE *NEUROTOXICOLOGY* 21 (6):  
1091-1100 DEC 2000

- We report here on a statistical study of 151,225 venous blood lead (VBL) tests taken from children ages 0-6 inclusive, living in 105 communities of populations from 15,000 to 75,000....
- These data contradict the null hypothesis that there is no difference between the toxic effects of SiF and sodium **fluoride**, pointing to the need for chemical studies and comprehensive animal testing of water treated with commercial grade silicofluorides."

# A MORATORIUM ON SILICOFLUORIDE USAGE WILL SAVE MILLIONS

MASTERS RD FLUORIDE 38 (1): 1-5 FEB 2005

- “Lead, a toxin that lowers dopamine function, has been associated with violent behavior as well as learning deficits.
- Hydrofluosilic acid and sodium silicofluoride, which were 'substituted for **sodium fluoride without testing as chemicals for public water treatment, increase absorption of lead from the environment and are associated with violent behavior.**
- Given the costs of incarcerating violent criminals, these side-effects justify a moratorium on using silicofluorides for water treatment until they are shown to be safe.”

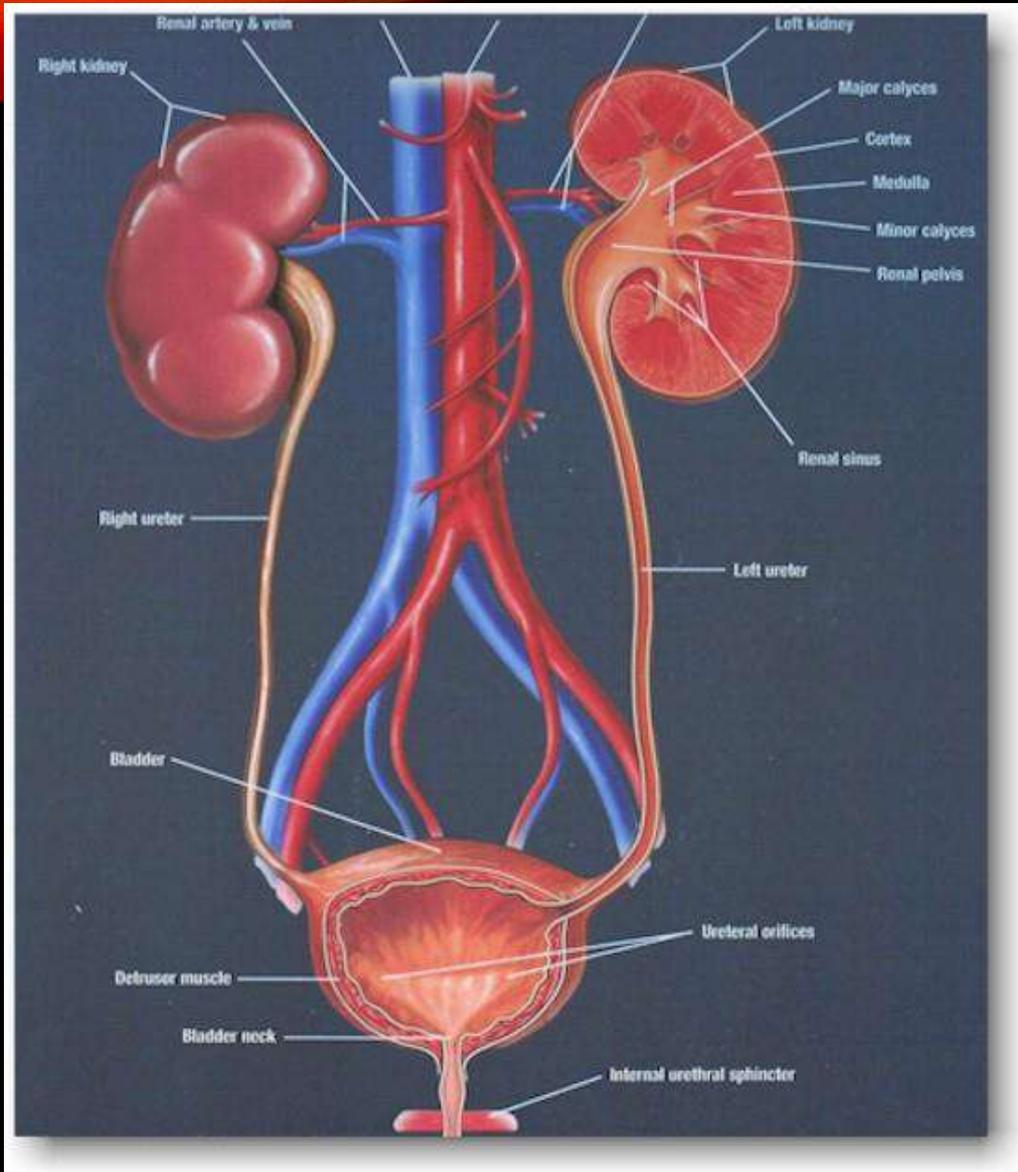


**CHROMOSOMAL ABERRATIONS AND MICRONUCLEI IN  
LYMPHOCYTES OF WORKERS AT A PHOSPHATE FERTILIZER FACTORY.  
MENG Z, ZHANG B. MUTAT RES. 1997 OCT 24;393(3):283-8.**

- “The frequencies of chromosomal aberrations (CA) and micronuclei (MN) in peripheral blood lymphocytes of 40 workers at a phosphate fertilizer factory in North China, were studied. HF and SiF<sub>4</sub> are the main air pollutants and small amounts of dust containing fluoride, NH<sub>3</sub> and SO<sub>2</sub> were also present in the factory.
- It was shown that the chemicals caused an increase in both CA and MN.
- Both CA frequency and MN frequency of the workers increased with length of the chemical exposure period up to 10 years.”



- “The current study was to see whether **fluoride** would also affect human birth rates.
- **Most regions showed an association of decreasing Fertility rate with increasing fluoride levels.**
- There is no evidence that this outcome resulted from selection bias, inaccurate data, or improper analytical methods.
- Whether or not the **fluoride** effect on the fertility rate found at the county level also applies to individual women remains to be investigated.”



# URINARY SYSTEM

**EVIDENCE SUGGESTING THAT HIGH INTAKE OF FLUORIDE PROVOKES NEPHROLITHIASIS IN TRIBAL POPULATIONS** SINGH PP, BARJATIYA MK, DHING S, BHATNAGAR R, KOTHARI S, DHAR V **UROLOGICAL RESEARCH 29 (4): 238-244**  
AUG 2001

- “The present study was designed to evaluate the role of **fluoride** in urolithiasis in humans.
- The prevalence of urolithiasis was 4.6 times higher in EA than in NEA. Furthermore, the prevalence was almost double in subjects with fluorosis than without fluorosis in the endemic area.
- In conclusion, the data suggest that **fluoride** in vivo may behave as a mild promoter of urinary stone formation by (a) excretion of insoluble calcium **fluoride**, (b) increasing oxalate excretion and (c) mildly increasing the oxidative burden.”



# **FLUORIDE REMOVAL/FILTRATION**

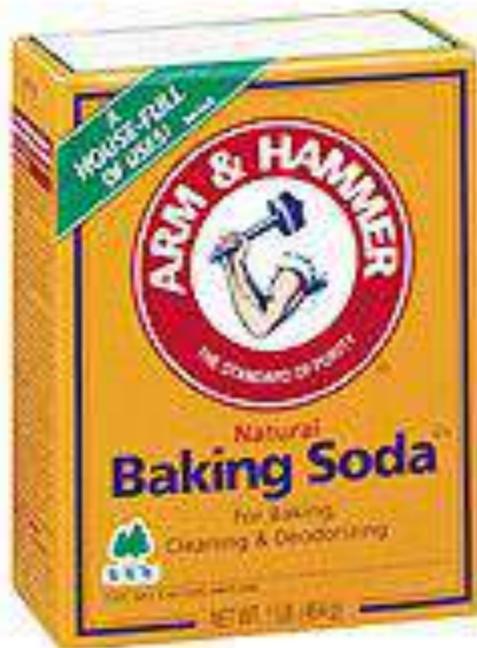
**INTEGRATED BIOLOGICAL AND PHYSIOCHEMICAL TREATMENT PROCESS FOR  
NITRATE AND FLUORIDE REMOVAL. MEKONEN A, KUMAR P, KUMAR A.  
WATER RES. 2001 SEP;35(13):3127-36.**

- “The feasibility of an integrated biological and physiochemical water treatment process for nitrate and fluoride removal has been evaluated...
- In all cases a fluoride concentration of 20 mg/l in water could not be reduced to the acceptable level of 1.5 mg/l.”



THERE IS HOPE

# ALTERNATIVES TO FLUORIDE TOOTHPASTE



NET WT. 6 oz. (170g)

**natural**  
*propolis & myrrh*  
**baking soda**  
toothpaste

Contains *baking soda* & *calcium* for clean teeth  
and *propolis* & *myrrh* for a healthy-feeling mouth

**gingermint**

[EFFECTS OF FLUORIDE ON PROLIFERATION AND DIFFERENTIATION OF RAT OSTEOBLASTS IN VITRO AND THE ANTAGONISTIC ACTION OF VITAMIN C]  
ZHANG Y, SUN GF, JIN YP, JIA LH, WANG Y ZHONGHUA LAO DONG WEI  
SHENG ZHI YE BING ZA ZHI. 2003 AUG;21(4):250-2.

“The inhibition on proliferation and differentiation at 2 mmol/L NaF was antagonized by vitamin C. CONCLUSION:

- **Fluoride had a two-phase effect on osteoblasts, vitamin C could antagonize the inhibitory effect of higher concentration of fluoride on proliferation and differentiation of osteoblasts.”**

**[EFFECTS OF SELENIUM AND ZINC ON THE DNA DAMAGE CAUSED BY FLUORIDE IN PALLIUM NEURAL CELLS OF RATS]** CHEN J, CHEN X, YANG K. WEI SHENG YAN JIU. 2000 JUL;29(4):216-7.

- “The results showed that the degree of DNA damage in the fluoride group and the selenium group were significantly greater than that in control group ( $P < 0.01$ ).
- The damage in the fluoride group was even more serious.
- **Moreover, the joint antagonistic effect of selenium and zinc against fluoride was more obvious.”**

**MODULATION OF FLUORIDE TOXICITY IN RATS BY CALCIUM CARBONATE AND BY WITHDRAWAL OF FLUORIDE EXPOSURE. EKAMBARAM P, PAUL V PHARMACOL TOXICOL. 2002 FEB;90(2):53-8.**

- **“It is concluded that the dose of CaCO<sub>3</sub> used in the present study has a potential to prevent the toxicity of fluoride by maintaining serum fluoride at a less toxic level.**
- **Further, the toxic effects of fluoride are reversible if its exposure is withdrawn for 2 months.”**

**BENEFICIAL EFFECTS OF THE AMINO ACIDS GLYCINE AND GLUTAMINE ON  
TESTIS OF MICE TREATED WITH SODIUM FLUORIDE** CHINOY NJ, MEHTA D  
FLUORIDE 32 (3): 162-170 AUG 1999

- “These results show that NaF affects testicular steroidogenesis, protein levels, and HSD and SDH activities in mice.
- **The effects, however, are transient and reversible, with the amino acids glycine and glutamine producing marked beneficial effects.**
- A protein-supplemented diet might therefore ameliorate the toxic effects of **fluoride** in endemic areas.”

# THE FLUORIDE DEBATE: THREE QUESTIONS

To analyze the effectiveness and safety of water fluoridation, we will need to answer three basic questions:

- **#1 What is fluoride?**
- **# 2 How does fluoride help prevent tooth decay?**
- **#3 Does water fluoridation work?**

# #1 WHAT IS FLUORIDE ?

- The ADA's answer is: fluoride is a naturally occurring element that prevents tooth decay systemically when ingested during tooth development and **topically when applied to erupted teeth.**

# #1 WHAT IS FLUORIDE ?

- Rebuttal: The ADA's answer to the question above leads one to believe that fluoride is something that occurs naturally in water. One would assume from their statement that some type of natural fluoride is added.
- This is not the case; **only calcium fluoride occurs naturally in water, and it has never been used for fluoridation.**
- Instead, according to the CDC, the chemicals most commonly used by American waterworks for water fluoridation are fluorosilicic acid, sodium silicofluoride, and sodium fluoride.

## #2 HOW DOES FLUORIDE HELP PREVENT TOOTH DECAY?

- The CDC states: "Fluoride's caries-preventive properties initially were attributed to changes in enamel during tooth development..."
- However, laboratory and epidemiologic research suggests that fluoride prevents dental caries predominately after eruption of the tooth into the mouth, **and its actions primarily are topical for both adults and children."**

## #2 HOW DOES FLUORIDE HELP PREVENT TOOTH DECAY?

- Rebuttal: Both the ADA and the CDC's answers states that fluoride benefits teeth topically. If fluoride provides its benefits topically, it makes more sense to apply it in the form of toothpaste.
- To put it in the drinking water, where systemic exposure and all the accompanying risks become inevitable, does not make sense.

# #3 DOES WATER FLUORIDATION WORK?

- Los Angeles County is 44% fluoridated, yet 75% have tooth decay. (LACHHS, 2000)
- The city of Long Beach is fluoridated, yet have more cavities (75%) than the State of California (71%) while the state-wide fluoridation rate is only at 27%. (Press-Telegram, 2/6/06)
- Alameda County, with five fluoridated districts, had twice the statewide number of students needing urgent dental care. (Contra Costa Times, 02/06/2006)

# #3 DOES WATER FLUORIDATION WORK?

- In comparison, Nassau County, New York, has a 50% cavity rate while being NON-fluoridated. **(Nassau County Community Health Assessment 2005-2010)**
- Researchers discovered in New Zealand over a 50-year period, the decline in tooth decay in that country commenced before and independently of the introduction of fluoridation and other uses of fluoride. (Colquhoun J., 1993)

# #3 DOES WATER FLUORIDATION WORK?

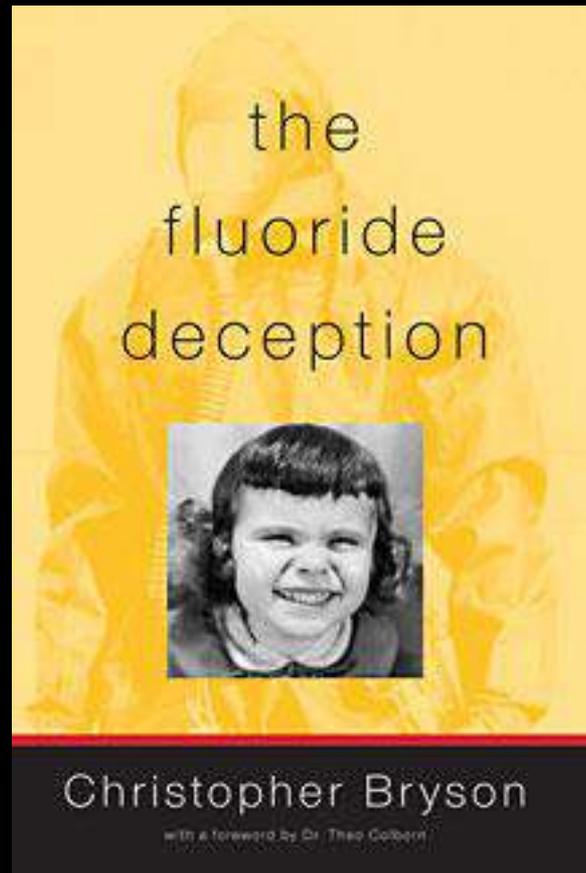
Meanwhile...

Fluorosis, a condition of white spotted, yellow or brown and sometimes pitted or crumbly teeth, caused by too much fluoride, is on the rise over the past 30 years in the United States.

Fluoride intake and prevalence of dental fluorosis: trends in fluoride intake with special attention to infants. *Journal of Public Health Dentistry* 60(3):131-9. Fomon SJ, Ekstrand J, Ziegler EE. (2000).

# IN CONCLUSION:

- Fluoride effects teeth topically and systemically prior to tooth eruption.
- Water Fluoridation does not work.
- Fluoride is found in many water based foods like juices, baby formula and used in pesticides.
- Fluoride effects intelligence, fluorosis, bone fractures, kidneys, the brain, reproductive systems, DNA, and liver.
- Vitamin C, selenium, zinc, glycine, glutamine, and calcium can help reverse the toxicity effects of fluoride.



For more information read this book

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